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The Public Lighting Tables of the American Meter Company will be found in the page advertisement of that Company.

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[OFFICIAL NOTICE.]

Respecting the Official Work of the American Gas Light Association.

AMERICAN GAS LIGHT ASSOCIATION,
SECRETARY'S OFFICE,
530 Broadway, N. Y., Dec. 13, 1904.

To the Members American Gas Light Association: As there seems to be some misunderstanding respecting the standing of the official management of the Association, members will please note that the undersigned is the Secretary of the Association, and that Mr. A. E. Forstall is carrying forward the work of the Practical Class. All correspondence in connection with the Practical Class should therefore be addressed to Mr. A. E. Forstall, 58 William street, and all other matter pertaining to the Association to MR. GEORGE G. RAMSDELL, Secretary, at the above address.

BRIEFLY TOLD.

HOW TO OBTAIN COPIES OF THE OHIO'S LAST QUESTION BOX.—The following notification from Mr. Henry L. Doherty, Editor Question Box, Ohio Gas Light Association, respecting the matter named in the title, requires no further explanation—orders may be sent to him at Denver, Col.: "A limited number of copies of the 1905 Question Box of the Ohio Gas Light Association are available. This year's edition contains 567 questions and 4,920 answers, contributed by 519 gas men. The cost of compilation has exceeded $5,000. It is necessary, therefore, to charge those who have not contributed answers a nominal price for copies of the book. Copies can be obtained, transportation prepaid: Bound in paper, for $1.50 each; bound in cloth for $2.50 each; bound in leather for $3.50 each. It is not anticipated that the present edition will supply all wants. If you wish a copy apply immediately and one will be reserved for you."

METER SERVICE CHARGE IS DECLARED VALID BY CITY ATTORNEY A. L. SHIPMAN, OF HARTFORD, CONN.—A correspondent, writing from Hartford, Conn., under date of the 20th inst., says: I fail to have seen in the JOURNAL any mention of the opinion of the City Attorney (Mr. A. L. Shipman) respecting the validity of the meter service charge of 50 cents per month instituted by the Hartford City Gas Light Company under certain conditions determined by the monthly gas bills of the user. It seems to me an important matter, and I forward the text of the opinion in the hope that you can see your way clear towards publishing it.

The opinion is as follows: "To the Honorable Court of Common Council—Sirs: You have asked for an opinion as to whether or not the contemplated action of the Hartford City Gas Light Company, making a monthly service charge of 50 cents to customers who do not use 500 cubic feet of gas in any month, is within its corporate authority and can be legally exacted. My opinion is in the affirmative. My reasons are as follows: The charter of the Company, Special Laws, Vol. 3, page 568, provides that the Company may 'furnish such quantities of gas as may be required in the city of Hartford for lighting streets, stores, or buildings, or other purposes, and to enter into and execute contracts, agree-

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ments or convenants in relation to the objects of said Company, and to enforce the same.' No one can question that the Gas Company can make such arrangements with a new customer as the contracting parties agree upon, and that it is within its corporate powers under the provisions of the charter above cited to stipulate that it will not send its gas through its meter to the customer's burner unless the customer agrees to pay a minimum rate, irrespective of whether he opens the burner or not. It has been held in New York, under its electric light laws, which require a Company to make connections and furnish light to any building, but which contain no provision limiting the rate which may be charged by the Company, that it may require as a condition precedent an agreement to pay a reasonable minimum monthly charge. Gould vs. Edison Illuminating Company (1899), 60 N. Y. Supp., 599. We are apt to be confused when we consider this matter in reference to a former customer. He has heretofore had a rate based upon the amount of his consumption. The rate can be changed by the Company, however, upon due notice accepted by him. What constitutes acceptance—which, of course, is essential to modify the contract? Not the publication of the rate alone, for it takes two parties to make a bargain, but payment of bills based on the new rate without objection. If the new rate is unsatisfactory to the customer when the bill is presented, he may decline to make payment in accordance therewith. Thereupon, the sole remedy of the Company is to decline to furnish gas to the customer. The customer cannot demand gas at his own price, neither can the Company force him to burn gas at the new price. The city of Hartford is in the eye of the law a private customer of the Gas Company. If it cannot make a satisfactory contract with the Company, it must obtain light elsewhere or seek regulation of rates by legislation, general or special. The effect of such legislation, if enacted, is to amend the charter of the corporation in the particulars covered by the legislation. Such legislation as to rates, however, is always subject to revision by the courts. The police power exercisable by the general assembly can be used to regulate, but it cannot be used to destroy public utilities constructed and operated under legislative franchise—that is, the State cannot take property without due process of law."

NOTES—

THE Gas Machinery Company, of Cleveland, O., has been awarded a contract by the Freeport (Ills.) Gas Light and Coke Company for the installation of the necessary increase of purifiers to take care of its rapidly growing output. The Machinery Company has also contracted with the Menominee and Marinette Light and Traction Company, of Menominee, Mich., for a complete set of condensing, scrubbing, washing, exhausting and purifying apparatus for coal gas, including meter and governor, to be erected on the Marinette (Wis.) division of the works.

LAST week we reported the voluntary resignation of Mr. H. M. Sage, from the position of Secretary to the Cincinnati Gas and Electric Company, the same to become effective May 1st. At the meeting of the Directors when Mr. Sage's resignation was considered and adopted, it was voted to award him a life pension equal to 20 per cent. of his present salary, which, however, is only the usual custom of the Company respecting retiring or retired employees who have been in its service 30 years or more. That the Company means to make important main extensions this year is shown from the fact that it has just closed a contract with the United States Cast Iron Pipe and Foundry Company for cast iron pipe for delivery in the next twelvemonth, which contract involves an expenditure of not less than $100,000, and which expenditure may reach $150,000.

"R. S." is informed that the American Pipe Company's regular quarterly dividend of 3 per cent. is payable the 1st prox., to stockholders of record of March 15th. The offices of the Company are on 112 North Broad street, Philadelphia, and its Treasurer is Mr. George M. Bunting.

THE final instalment of 25 per cent. of subscriptions to the convertible debentures of the New Haven (Conn.) Gas Light Company is payable on or before April 1st, at the office of the New Haven Trust Company.

ON the 19th inst,, Mr. Louis R. Dutton, Superintendent of the Jenkintown and Cheltenham (Pa.) Gas Company, delivered a lecture on "How to Make Gas," in the lecture room of the Y. M. C. A.'s building in West Chester, Pa. His lecture, which was delivered in popular vein, was listened to with attention by an audience fairly representative of the Borough's best citizens.

MR. WORTHINGTON SCRANTON, who for the last 3 years has acted as Assistant to the President of the Scranton (Pa.) Gas and Water Company, has been appointed Vice-President of the corporation.

THE 16.h annual meeting of the engineers, superintendents and managers of the plants of the United Gas Improvement Company, was successfully brought off at the Hotel Walton, Philadelphia, Pa., last week. The sessions lasted 3 days and the attendance was not far from 150.

[OFFICIAL REPORT.—REVISED BY THE SECRETARY.—CONTINUED FROM PAGE 451.]

THE THIRTY-FIFTH ANNUAL MEETING OF THE NEW ENGLAND ASSOCIATION OF GAS ENGINEERS.

HELD IN YOUNG'S HOTEL, BOSTON, MASS., FEB. 15 AND 16, 1905.

FIRST DAY—AFTERNOON SESSION.

Discussing the Paper by Mr. H. A. Carpenter.

[For the text of the Carpenter paper, entitled "The Importance of Firebrick Materials to the Modern Retort House," see JOURNAL, March 20, 1905, p. 450.]

The President—The discussion upon this subject may be approached from many sides. The paper opens up possibilities. It is of great importance to every gas man, especially one who is not making all water gas, and it might apply in a degree then. I think that the discussion might be opened with profit and pleasure to us by our friend, Mr. Daly, if he has some data or information, and I know that he has a great deal of both.

Mr. Daly—I received from your Secretary yesterday a copy of this paper, on which was written, "What have the firebrick men to say?" Well, the firebrick men generallv are very diffident and don't care to express themselves in a meeting of this kind; but as I have been the recipient of your kind invitations for so many years, I feel it would be rather ungenerous if I did not say a few words after receiving this intimation, especially as it is really a selfish matter with both of us. You men are as much interested as we are in your getting the very best materials. These are necessary, as Mr. Carpenter has well said, in order to increase the efficiency of retort benches. And so, if you will pardon me, I will read a few thoughts I have jotted down in connection with this paper. With mechanical charging it is possible to increase the charges very materially. A retort, 15 inches by 26 inches, cross-sectional area, means practically 2½ cubic feet space per lineal foot, and while coal is given in handbook tables as weighing 75 pounds per cubic foot, the way it is generally handled in charging would probably average, say, 46 pounds per cubic foot, which would make the possible capacity per lineal foot of retort of the size mentioned, say, 110 pounds. This seems almost incredible, but if you figure it out you will find that it is so. This, however, is without providing the space for gas expansion in the distillation. With mechanical handling in charging and discharging retorts, it is necessary to provide a higher grade retort with heavier settings, but the length of service obtainable for retorts and settings depends a great deal upon the type of furnace, its manipulation and the controlling of the heats in comparison with the weight of charges. Given a properly constructed furnace, and a proper balance between the temperature of the heats carried and the charges made, the service obtained should be materially increased over that where insufficient attention is paid to these points. A better length of service could be obtained where retorts are used with the high heats and charges made accordingly, the coal absorbing the heat and preventing the reducing action on the retorts and settings. Retorts and settings deteriorate more in service where high heats and low charges are the rule than where high charges and high heats are maintained. These are points we have been presenting to the gas managers for some time. I view with disappointment the tendency to use low priced material, without a sufficient consideration of the refractoriness of the material, and in some instances the preference at higher cost shown for goods made abroad. The most refractory clays are as available to American manufacturers as to foreign, there being no European manufacturer who has not to go to various locations for his clay supplies; and we, as well as they, have the intelligence and ability to work out the most suitable combinations for the purposes required. The American manufacturers should have the encouragement of the home gas engineers and the favoring of home made products, at least at as high a cost as paid for the imported goods, enabling the use of clays that will resist higher temperatures and the increased pressure of weight under the higher heats necessary to maintain to permit the larger charges possible with the use of mechanical operations. It is not alone the question of using the clay resisting the greatest degree of temperature, or the clay with the least amount of shrinkage under a pressure during the application of heat, as it is a combination of clays prepared under careful supervision and selection, combining the most composite efficiency of all these points, at the same time obtaining a mixture that will provide the greatest limit of elasticity when subjected to the varied changes of temperature prevailing while the bench is in operation.

The President—We are under obligations to Mr. Daly for coming

here; and certainly deeper obligations for the important addition to this paper which he has made. There surely ought to be one or more members who have recently installed modern equipment for coal gas by whom might be given practical experience of value to us now, and it would have a direct bearing upon this very question. There is no dispute, I think, in the minds of all New Englanders that if the same results can be had, and they ought to be had, in the use of American goods, they should and would be preferred. Will Mr. Wood, of Boston, tell us something if possible concerning the use of imported material? Hasn't the Boston Company used some.

Mr. Wood—We have used some, but it is a great many years since we have bought foreign stock. We have used American material almost exclusively for the last 10 or 15 years. Some settings were imported (the original settings at Commercial Point) but they have all been replaced by American goods, and the material, as far as retorts go, which we now procure on this side of the water, gives us fully as good service as the imported stock. I was going to ask Mr. Carpenter if he knew of any actual cases where they were charging as high as 60 pounds to a lineal foot of retort, as he recommends in his paper. It seems to me like "straining the jug" a little bit to put that amount of coal in and get it out. There is no question about the room for that number of pounds in a foot, as Mr. Daly has shown by his computation, but when it comes to a question of charging coal and getting the coke out it seems to me, while it might be done, that would be pretty close to the limit. It may be with the modern arrangements of pushing the coke that that can be done and is being done. I have seen several plants supposed to be up-to-date, and none of their figures that I have had so far reach quite that weight for a lineal foot.

Mr. Prichard—When we are charging 1,000 pounds to the lower retorts, which are now running 6-hour charges, it figures per actual foot something like 55 pounds. If you deduct the 18 inches at each end, as Mr. Carpenter suggests, that would be something like 68 to 70 pounds.

The President—Is that the result in your case?

Mr. Prichard—We charge 1,000 pounds in the lower retorts, and burn 6 hours.

The President—Has Mr. Acker some information to give?

Mr. Acker—No, sir. Although I am representing a manufacturer here, I have been for a short time connected with the concern, and know nothing about the manufacture, simply the constructing.

The President—Who else at this point desires to add his testimony? It will be of importance to everyone who wants to know. Mr. Carpenter, is there anything more that you would like to say? Are there any details that you wish to explain or further discuss personally?

Mr. Carpenter—There is only one point, which has rather been implied by Mr. Daly. I don't think foreign materials were mentioned in my paper. The idea was to show that the best materials, and so far as I know we all look at it the same way, whether they are foreign or home drawn, we can afford to have for the retort settings, practically regardless of price. The idea was that if by spending more money in the manufacture of retorts and settings, at home or abroad or anywhere that they are to be had, so they can be improved, the modern retort house can stand the extra expense.

The President—I didn't interpret Mr. Daly's statement that it applied to your paper, but rather it meant to state, and did so, that the American manufacturer was just as reliable and just as good as the foreign manufacturer.

Mr. Daly—Yes; I thought, Mr. President, you gentlemen would be interested to know that American manufacturers are alive to the question. They should be alive to it; it is a necessity for them. So that I wish to have you understand we are taking it up. Of course we are disappointed that people should go abroad, but we certainly have no right to find any fault with their going abroad. They have gone abroad simply because they thought it was the best thing for them to do, and no doubt may be it has been. But we are learning lessons. We want to be, you know, a little like the Arctic explorer, who told his men, "Now, remember that rest is sleep; but sleep is death." The firebrick makers don't wish to be put in that last category; they wish to keep alive and push ahead.

The President—I think all here share that same opinion. That is expressed, I believe, by you all.

On motion of the Secretary a vote of thanks was passed to Mr. Carpenter for his paper.

The President—This will end the afternoon session, as it is now 5 o'clock. The proceedings of the convention will be resumed to-morrow morning.

SECOND DAY, MORNING SESSION.

The President—This part of the Association will come to order—those who are here—and we will hope for the presence of more without much delay.

ADDITIONS TO THE MEMBERSHIP LIST.

The Secretary—Your Directors would present an additional report, that they have received and approved the following additional applications for membership:

Active.

Havener, F. N., Waltham, Mass. Lenon, J. E., Quincy, Mass.
Livor, J. E., Winchester, Mass. Pease, A. C., Lowell, Mass.
Sharp, R. P., Marlboro, Mass.

Associate.

Higgins, A. M.

On motion of Mr. Nettleton, the Secretary was empowered to cast the ballot of the Association for the names recommended by the Board of Directors. The Secretary subsequently reported that the instruction had been carried out, and the President declared the result.

The President—Mr. C. H. Gifford, of New Bedford, Mass., will now entertain us with his paper on

WORKING WITH DEEP PURIFIERS.

Sometime ago I promised the Secretary to bring to this meeting some figures on the working of our deep purifying boxes. On reading a copy of the programme, I was very much surprised to find that I was down for a paper on "Working with Deep Purifiers." What I have written hardly deserves to be called a "paper;" it is but the collection of a few notes. The purifying boxes at New Bedford are of the so-called, "Deep Box Type." They consist of three duplex boxes, 16 feet by 20 feet, by 11 feet 6 inches deep, with a dry lute instead of the usual water seal.

The connections are so arranged that boxes A and B can be made either first or second at will, while box C is always the third or catch-box. The inlet is through a pipe carried inside the box to the top and bottom of the box, while the outlet is from the center of the box. The oxide is in two layers, each about 5 feet deep. Each box holds about 2,500 bushels of oxide, leaving about a foot space between the upper and the lower layers.

The boxes were completed early in February, 1904, and put in commission the 10th of the same month.

We soon found that the usual lead acetate test was useless, as the second box showed foul very soon, but instead of growing rapidly worse it remained in the same condition a long time. By reversing the flow of the gas in the first box with the use of air, it was possible to clean the second box some. Box B, which happened to be the first box when they went into commission, ran 87 days, passing 38,000,000 feet, and when turned out was taking out 64 to 70 per cent. of the HS.

Box A ran 73 days as second box, and 42 days as first, passing 30,000,000 and 16,000,000 feet respectively, and was removing 65 per cent. of the HS when changed.

We tried various lengths of time between reversals of boxes; once a a week, twice a week, every other day, etc. Our usual method has been to reverse the first box every Monday morning. It is our aim to use 1½ per cent. of air, but with the blower driven by the coal gas exhauster, while the water gas has a separate exhauster, it is difficult to keep the percentage uniform. The two gases are mixed at the inlet of the purifiers.

Beginning with June 23d, I have almost daily records of the HS in the gas before each box, and also after the catchbox. From these records I have prepared tables showing the same, and also the per cent. removed by each box, and the per cent. left in the gas after passing the catchbox. These tables were made by taking the record for the day the box was changed and each succeeding seventh day. These percentages do not add to 100 because the fractions were omitted. I have also made a table showing the number of changes during the year, and the amount of gas passed between changes.

On removing the oxide, it is found to be nearly uniformly fouled with a thin section in the center of each layer showing cleaner. We usually empty a box one day and refill it the next, getting it turned in by the middle of the afternoon, and keeping it out of use from 30 to 35 hours.

By referring to Table E, it is seen that it is no longer between changes now than at first, and that more gas is purified, which is probably due to the oxide being in better condition. The oxide was home-made, and perhaps the iron was not thoroughly oxidized at first, as we were anxious to get the new boxes at work. I have never seen more

TABLE OF PURIFICATION RESULTS.—*Showing the Number of Grains H_2S in 100 Cubic Feet of Gas before each Box and after Catch-box, also per cent. Removed by each Box and left in Gas.*

A. Month.	Day.	Grains H_2S in Gas.	Per Cent. H_2S Taken Out by Box B	Grains H_2S Left in Gas.	Per Cent. H_2S Taken Out by Box A	Grains H_2S Left in Gas.	Per Cent. H_2S Taken Out by Box C.	Grains H_2S Left in Gas.	Per Cent. H_2S at Meter.
6th.	23d.	328.9	87	44.4	11	1.3	1.2	...	...
"	30th.	441.3	85	63.5	13	5.2	1 3	1 8	.7
7th.	7th.	474.9	58	197.5	40	7.2	1.5	...	..
"	14th.	407.6	85	48.8	11	2.8	.6	...	..
"	21st.	471.3	68	149.6	30	4.4	.6	1.6	.3
"	28th.	464.1	71	132.1	27	4.8	.4	2.2	.4
8th.	3d.	374.0	41	220 4	57	5.6	.8	2.6	.5
"	4th.	....	..	388.9	95	18.7	4.0	2.4	.6

B. Month.	Day.	Grains H_2S in Gas.	Per Cent. H_2S Taken Out by Box A.	Grains H_2S Left in Gas.	Per Cent. H_2S Taken Out by Box B.	Grains H_2S Left in Gas.	Per Cent. H_2S Taken Out by Box C	Grains H_2S Left in Gas.	Per Cent. H_2S at Meter.
8th.	5th.	355.3	80	71.0	19	3.1	.5	.9	.2
"	12th.	380.1	90	37.4	9	1.8	.4	...	...
"	19th.	392.7	90	37.4	9	1 8	.4	...	...
"	26th.	377.5	89	39.9	10	1.8	.4	...	...
9th.	2d.	406 5	79	82.4	19	1.8	.4	...	...
"	16th.	326.7	62	123.4	35	8.0	1.0	2.1	.6
"	19th.	315.0	49	159.7	46	13.3	1 0	9.0	2.8
"	20th.	....	..	333.9	93	21.7	3.0	10.1	3.0

C. Month.	Day.	Grains H_2S in Gas.	Per Cent. H_2S Taken Out by Box B,	Grains H_2S Left in Gas.	Per Cent. H_2S Taken Out by Box A.	Grains H_2S Left in Gas.	Per Cent. H_2S Taken Out by Box C.	Grains H_2S Left in Gas.	Per Cent. H_2S at Meter.
9th.	21st.	348.4	95	21.7	5	1.8	.4	...	...
9th.	28th.	312.1	94	18.1	5	1.8	.5	...	...
10th.	5th.	312.1	90	29.0	8	3.6	1.0	...	...
"	12th.	239.5	87	29.0	10	4.1	1.0	1.0	.4
"	19th.	238.5	84	36.3	13	4.5	1.0	1.0	.4
"	26th.	326.7	79	68.9	19	3.6	1.0	. .	...
11th.	2d.	283.1	68	90.7	30	5.4	1.0	1.2	.4
"	9th.	275.9	52	131.3	44	8.3	1.0	3.6	.1
"	16th	276.6	64	76.3	32	5.7	1.0	1.8	.8
"	21st.	279.5	44	156.0	52	9 5	1.0	6.3	1.7

Month.	Day.	Box A.		Box B.					
11th.	21st.	304.9	88	34.6	..	39.9	11.0	5.4	1.7
"	23d.	272.2	90	25.4	6	7.2	1.0	4 5	1.0

Month.	Day.	Box B.		Box A.					
11th.	28th.	319.4	59	130.6	30	32.6	7.0	9.5	2.0
"	29th.	.....	..	373.8	90	36.3	7.0	9.5	2.0

D. Month.	Day.	Grains H_2S in Gas.	Per Cent. H_2S Taken Out by Box A.	Grains H_2S Left in Gas.	Per Cent. H_2S Taken Out by Box B.	Grains H_2S Left in Gas.	Per Cent. H_2S Taken Out by Box C.	Grains H_2S Left in Gas.	Per Cent. H_2S at Meter.
12th.	1st.	363.3	96	42.5	1	7.2	1.0	1.5	.4
"	7th.	297.6	84	47.1	14	3.6	1.0	...	...
"	14th.	373.8	89	39.9	9	3.6	.9	...	...
"	21st.	275.8	65	94.3	31	8.1	2.0	1.8	.6
"	28th.	271.2	66	90.7	29	10.3	1.0	5.4	1.9
1905.									
1st.	4th.	319.4	90	29.0	8	4.7	.6	2.5	.7
"	11th.	308.5	85	36.5	10	5.9	.6	3.6	1.0
"	18th.	317.2	91	26.4	6	5.4	.9	2 5	.7
"	25th.	326.3	94	18.5	3	7.2	1.0	2.0	.6
2d.	1st.	326.7	93	21.7	3	10.8	2.0	1.8	.5
"	8th.	257.7	93	18.1	3	9.1	2.0	2 5	.9

TABLE E., *Showing Changes of Boxes and Gas passed between Changes.*

Box.	Days, 2d Box.	Gas Passed in Thousands.	Days, 1st Box.	Gas Passed in Thousands.	Total Days.	Total Gas in Thousands.
B....	73	29,995	87	38,160	87	38,160
A ...	42	15,651	42	16,251	115	46,246
B....	42	16,235	44	16,997	86	32,648
A ...	46	20,137	48	20,671	90	36,906
B....	69	35,615	70	36,226	116	56,363
A ...	69	43,260	71	43,649	140	75,269

than 6-tenths of an inch back pressure on any of the boxes, which is reduced to three or less on reversing the box.

Box C (the catchbox) was changed July 6th, to make slight repairs on it, since which time it has been continously in use and is still doing good work.

I believe that if we had 4 boxes of the same size as at present, so arranged that they could be thrown in any order of sequence, and the flow of gas reversed in any box at will, it would make the time between changes very much longer. In conclusion, I want to say that we have had absolutely no trouble with the dry seal on the covers.

Discussion.

The President—Gentlemen, you have listened to a very concise, interesting and instructive paper. Who in the room has had experience with the deep purifiers that would add information and corroborate the statements made by Mr. Gifford?

The Secretary—Mr. President, I should like to call on the gentleman from North Adams, Mass.

The President—It is too bad the suggestion was made until the experience of Pawtucket might be detailed, but Capt. McGregor is not here. Mr. Barnum, what can you say as to the experience in Worcester, if any, in this direction?

Mr. Barnum—We have not the deep boxes. I should like to ask Mr. Gifford what test he uses in determining the hydrogen sulphide?

Mr. Gifford—The starch iodide test. It is not the U. G. I. test exactly, but is based on the same principle. The action is similar to that.

The President—It is to be regretted for the benefit of the members here that more people cannot tell their experience or have not deep purifiers, but I think perhaps it may be fortunate for many people that they have not if they experienced the same conditions that we did. It may be we are not yet sufficiently experienced or learned in the art of operating the purifiers successfully. We have three, I think, made by the same people. They are 12 by 16 by 11½. They each take, in the way we charge them, 1,300 bushels. It may be the oxide we had was not just perfectly made. It may be that the straight coal gas is not properly made. But in any event we have had a very unfortunate and unsatisfactory experience with the deep purifier. I do believe, however, with proper oxide and gas properly made, that it is the right principle, in view of the fact that it is possible to have any combination in the boxes, 1, 2 or 3, or 2 and 3, or 1 and 3, and the catchbox always is available for change. In one year, in making less than 70,000,000 cubic feet, we changed 8 times. The oxide had to be left out of the box from 8 to 11 or 12 days, and the 1st or the 2d or the 3d or 4th day it had to be turned, not only by day but at night. It was a very strenuous proposition for us to change a box. The last 3 months has shown an improvement. If it is not corrected, I think that the equipment will have to be examined by the people who furnished us the same, to pass upon our ability to use it, or the quality of the outfit itself. The information in detail I would not want to give for several reasons. It would discourage you, and perhaps embarass me. The most uncomfortable physical condition surrounding it is emptying the boxes. There is a sub-cellar to the set and the doors open below in the bottom of the boxes; but with our experience, only about 4 or 5 bushels will fall out from each opening under every box without the use of a long iron rod, and it is an uncomfortable and somewhat dangerous operation for the men. Perhaps another year I may be able to tell you a very much more encouraging story, but I would now qualify this by saying that the principle, I think, is correct. I am honest in stating that some conditions are not proper in the North Adams works, which may account for our experience. Is there not someone else here who has half-depth purifiers?

Mr. Slade—Mr. President, I have had several years' experience with the Chollar box, a deep box, and my experience is very much similar to that which you describe. We found that when we went to clean the boxes the oxide was extremely hard and had to be picked out, just like getting into concrete. We had trouble with the oxide firing in the box while it was being removed. We had to be very careful. They will run along, and conditions of emptying the box being so hard we very naturally like to make the changes as few times as possible, and by reversing the flow the boxes would clean themselves—sometimes, but not always. We had in the Chollar system two boxes, and as a result of this we would sometimes have to jump in and clean a box in a hurry. We would suppose that the box was going to clean up, and it would not always work as it should, which would leave us in very bad shape. We had no catchbox. Another trouble was we were not always certain just when to discontinue the oxide before it was spent. I would like to ask Mr. Gifford if he has any test to determine this, other than the old-fashioned one of trying it and finding out from prac-

tical use whether the oxide is done or not. My personal experience leads me to the conclusion that the shallow box was a great deal better, in that it was more conducive to peace.

Mr. C. H. Gifford—We have not run these boxes long enough to finally use up the oxide. We have only been running them just about 1 year. I understand that is what you mean; the final time to throw away the oxide?

Mr. Slade—Yes.

Mr. C. H. Gifford—We have not run them long enough to find that out. We made in the last year 174,000,000 cubic feet, I think, since the boxes were put into commission, with 5 changes on the first and second box, not counting the change on the catchbox, which was changed to make a little repair thereto. I don't know that we should have changed it at all at that time unless it had been necessary to repair the box. We have had some trouble in getting the oxide out of the boxes. The first one we emptied we got the oxide on fire in the box. We have four openings in the bottom of each box. Since that time I have only opened two at a time, and put 6 men in a box to break it down, and get down about half the oxide through two holes. Then we have had no trouble from getting fire in the box. If you open a hole through the bottom it makes a chimney, and there is a draft right up through, with the conditions as favorable as possible to getting trouble. We always have an extra box. We have 4 batches of oxide. We get the foul oxide down on the floor and spread it out that afternoon. The next morning we fill the box with a fresh batch that is already oxidized or has been handled over.

The President—That, of course, explains how the box can be filled the next day. We have paid over $45 in labor for unloading, caring for and recharging one single box, 12 by 16, by 11 feet 6. I would say that perhaps a shallower box of larger proportion would be somewhat less likely to consume nerve tissue, and relieve some embarrassment, but we hope to have different conditions and results to report in another year. We have no room for the extra amount of oxide ready to be put into the boxes. It has to be revivified on the cement floor underneath the line of three boxes. That was due entirely to the specifications furnished us, and the plant was built accordingly.

Mr. Gifford—It is a pretty hard place to put a man in those boxes; I recognize that fact. I usually intend to have all the help that is necessary, perhaps some more, when we change a box, but I have never changed a box unless I stood by them until the box was empty, to see there was no accident. They occasionally get all the gas that is good for them, but I have never yet had to help a man out of a box.

The President—Do you have leisure and time enough to stand by and see that box?

Mr. Gifford—I do do it. It is cheaper than it is to kill a man.

The President—You would not be able to do anything else for a week if you had the same experience that we have had.

Mr. Coffin—We have boxes 7 feet deep by 10 by 16. They are arranged to run up through the whole mass, or run into the middle and up and down. We at present are running them up and have run them since a year ago last September without any of these difficulties. We make a shaving scrubber of the first box. It catches all the oil and tarry vapors that get by your condensing apparatus. We never have used any air. We run about 10,000 to the bushel of oxide, which is more than double what we were ever able to do before. With that tarry or oily vapor taken out our sponge does not harden up at all. We are using the sponge that we put in there a year ago last September, and it apparently has not begun to go back any. Of course, like all new sponge, it would not run more than 3,000 or 4,000 to the bushel the first time, the second time it doubled up, and now it is up to about 10, and seems to stay there. We have 4 boxes, and always have a spare dose. We have plenty of time to revivify it. We change a box, and go along 6 or 7 weeks before we will have to change again. Our first box is practically a shaving scrubber.

The President—Have you a centerseal?

Mr. Coffin—We have a valve system. We cannot reverse, but we can run one box, two, three, or four, but they must be in sequence. When we want to change the shaving scrubber to revivify that a little we just run without it, just run boxes 2, 3 and 4, and cut that out.

The President—And then cut back again?

Mr. Coffin—Yes. Once we got caught on another box, and ran 2 boxes, cut 2 out, cut out the shaving scrubber, which did not heat any, just let it lie idle for a day, dumped that box out and refilled it, and then turned back on to the 4 again.

The President—The proposition would surely appeal to us, and would seem as though it was a right principle, especially after what had been told would follow by its adoption, and I have faith to believe that it can be worked out. Certainly your experience is in that direction.

Mr. Coffin—We are running through the whole mass, up through the material in the 7 foot box, 2 layers of 2½ feet each. We are having no trouble at all.

The President—That is reassuring testimony, Mr. Coffin, and surely the experience of New Bedford perhaps will satisfy us another year.

Mr. Cathels—Will Mr. Gifford tell us how much gas is purified per superficial foot of purifier per box?

The President—Have you that data?

Mr. C. H. Gifford—I have not.

The President—It could be figured out with these figures, I assume. What in your judgment is a fair average per bushel of oxide in the box, how many 1,000 feet per bushel of oxide?

Mr. C. H. Gifford—I have not figured that out.

The Secretary—I might say that from the table here (if you will pardon the interruption) that the lowest figure given here between changes, 116,251,000, is a trifle over 6,000 to the bushel, and in the case of the last figure given which is 43,000,000 (the box I understand has not yet been changed), it has already passed something like 17,000 per bushel, and is still working. I figured roughly that from the table.

Mr. Slade—I should like to ask Mr. Gifford if he has had any trouble in laying the oxide in the boxes evenly. There is a big difference, of course, between the box he describes and the Chollar box. The opening in the Chollar box is a small one on top, and I found great difficulty in laying the oxide evenly, so that the gas would not find a channel and practically by-pass the box.

Mr. C. H. Gifford—We can't put it in evenly with the elevator; we have to spread it with shovels. We usually spread it and tramp the oxide hard round the outside of the box; that is, men walk right round the outside of the box and tramp it down as hard as possible, leaving it light in the center. In that way we get a fairly good distribution. I have seen a box emptied when it looked like ribbon cake, perhaps.

The President—Are there any other members here who can and will give their experience in this direction, either as to the efficiency of the system or the results obtained.

Mr. C. F. Leonard—We have ordinary shallow boxes. Where we formerly changed once in 2 or 3 weeks, using 1.8 per cent. air, we have a valve system, and by reversing we are enabled to go 5 months.

The President—With the same amount of oxide, under the same conditions?

Mr. C. F. Leonard—Exactly the same conditions, other than we formerly ran 1, 2, 3, with the fourth box off; we then started in to reverse. Our valve system was such that we could reverse 2 and 1, but could not 3. That left 2 boxes (Nos. 3 and 4) not doing anything. We then tried 1, 2, 3 and 4, allowing the purified gas to go through the dirty box and clean it up, and the result was that where we changed once in 2 or 3 weeks we went to 5 months.

The President—When you reversed did you reverse in both boxes, or did you reverse say No. 1, and then when you reversed No. 2 turn No. 1 in the original direction again.

Mr. C. F. Leonard—It was the ordinary shallow box; that is, gas goes in at the bottom and out at the top. Our valve system would not permit reversing No. 3, so we put the gas into the top of No. 2. It ran down No. 2 and then down through No. 1.

The President—That answers the question. Of course those boxes were reversed.

Mr. C. F. Leonard—I might say that had a tendency to produce tar in the bottom of the box—at least, it collected there, and the drips did not carry it off—with the result that once it caused a caking in a box that we had to clean 3 or 4 inches thick, that had to be taken out with a pick. The tar reached the purifiers because of no shaving scrubbers to intercept it; but abandoning that system of running down, of using 2 boxes and instead of 4, gave much better results.

The President—Mr. Woodward, a paper on deep purifiers has been read by Mr. Gifford. The boxes in Pittsfield are deep boxes also?

Mr. Woodward—No, they are not.

The President—How deep are they.

Mr. Woodward—Five feet.

The President—Those are not real deep compared with the others. We shall be very glad indeed if any other member has anything to report upon the subject. We are under deep obligations to you, Mr. Gifford. The next question is:

> "Should gas companies favor setting all prepay meters to the exclusion of plain meters?"

Mr. Learned, what do you say? Have you many? Mr. Learned says, "no." What do you say, Mr. Wood?

Mr. Wood—I should say, "no."

The President—Will other members volunteer to express their opinion or give their experience? It seems to me the question is answered in the negative.

Mr. Woodward—Ask Mr. Nettleton.

The President—Mr. Nettleton, what is your idea or your experience?

Mr. Nettleton—I should say "no," most decidedly, as far as my experience goes. Perpaps I might add to that that we had a very large number of prepayment meters at both New Haven and Derby, and in the main they are working very satisfactorily, as I think they are elsewhere. For reaching certain classes of customers, the people who live from hand to mouth or the people who feel compelled to economize, the people of limited incomes, I believe it is the best appliance that we have. There are some outs to their use of course, but in the main they are a very good thing, and I believe it has added a very large quantity to the consumption of both of these companies.

The President—It seems to me the question has been answered very completely and satisfactorily, and along the lines of the experience of everyone who has tried the meters, by Mr. Nettleton's statement. Here is a simple question that follows:

> "How can napthaline be prevented from forming, and how can it be disposed of in street mains?"

Now, there is a field that is pleasant and simple for all of the expert gas engineers and others here. I leave the floor and the field open now for that simple question to be answered. The time is limited, and if everyone is going to speak on it they had better begin. There is a committee appointed that, like the committee on electrolysis, might bring in valuable information. I believe that committee is going to be continued, however; it asks to present a report at the next annual meeting, at the request of the chairman, Mr. Prichard. Possibly before this question is answered by the members they might be interested in a letter which the Secretary will read.

The Secretary—This is in the form of the following letter to the Secretary from Mr. Frederic Egner.

Mr. Egner—"How can naphthaline be prevented from burning?" This simple question admits of more than one interpretation. Primarily naphthaline is produced by abnormally high heats in either coal gas or water gas manufacture. The "how" and "why" are known, but are not a part of this question. The answer would be, as I view it, do not carry such heats as you find in your practice to be productive of naphthaline in objectionable quantities. Should the naphthaline production make itself felt only after leaving the storage holder, it is evidently no longer a question of production and yet it was partly so considered at one time. In the early "Proceedings of the American Gas Light Association," now on file in your Association Library, will be found a paper by the late Mr. Ignatz Herzog, Engineer of the Metropolitan Gas Light Company, of New York city, in which he asserted, that if gas could be freed from moisture (absorbed by it being stored over water in the holder tank) there would be no naphthaline deposits. Having had the honor to be well acquainted with the gentleman named I have reasons to believe that before writing his paper on naphthaline he had made exhaustive tests to fortify himself in his argument. Then to prevent the forming, or really the depositing of naphthaline in street mains the writer has more than once suggested his belief that if one or two boxes, on the order of purifying boxes, could be placed in the outlet main, just after the gas leaves the holder, said boxes to be filled with carbide of calcium, that would effectively dry the gas (for the enormous affinity of the carbide for moisture is, as you know, the basis of acetylene gas formation) but would be found a valuable enricher to a moderate extent, and be comparatively inexpensive. With two such boxes the resultant lime could be removed from one, while the other would be in operation; and the first box could be refilled with fresh carbide during the time. Next we have the query, "How can naphthaline be disposed of in the street mains?" I have disposed of it as follows. At the outlet main to city, insert pipe, shaped somewhat like a common U-funnel gauge. The long leg of this arrangement is screwed into the gas main with a stopcock between. Then arrange a barrel or tank containing gasoline (about 84°) conveniently; place a funnel into one leg of the "U" tube, and during the hours of heaviest consumption of gas run the gasoline into the said outlet main to the city at the rate of about one-fifth of a pint per 1,000 cubic feet going out. I used this plan at Norfolk, Va., and afterwards at St Louis, Mo., with much success, and have known others to do the same. It is simple, cheap and effective. As a palliative, if not altogether preventative, I beg leave to mention the following: I have found in the manufacture of coal gas that, using one in every 20 or 24 retorts as an oil retort, the result was not only the cheapest possible method of enriching said coal gas, but that even with very high heats carried in the benches, the naphthaline nuisance was greatly reduced, and with a larger percentage of oil retorts to the coal retorts it could be eliminated altogether. This last part of my answer seems to apply to both questions quoted, and the method of doing it will be found fully described in the AMERICAN GAS LIGHT JOURNAL, July 11th, 1904, and in *Progressive Age* for December 15th, 1904. In conclusion I will call your attention to a new way to use lead in making street main joints. In this method the lead is reduced to very finely divided shavings, in which condition it is known as "Wool of Lead." It can be caulked into the joints regardless of the weather and sometimes condition of the ditch in which the work must be done. I learned this way of doing the work before the making of "Lead Wool" had become—as it is now—a branch of an industry for reducing metals into the form required for several other purposes.

The President—How far does the meeting conclude that that simple question is answered? Is there any testimony to be added to it, or any other discussion to follow?

Mr. Nettleton.—Mr. President, the question of "How can naphthaline be prevented from forming?" I doubt if any of us can answer fully. Perhaps in water gas it can be said that no naphthaline, or practically none, need be produced, but in coal gas manufacture I believe that naphthaline is always produced. Under certain conditions you may make more, under other conditions you may make less, but you always produce some. There are means and ways of taking naphthaline out of the gas by some solvent, and there are quite a number of these solvents. At New Haven we have been following a plan for perhaps two years for testing for the presence of naphthaline that to me has been extremely satisfactory. And let me say, in the first place, that I got the information from the United Gas Improvement Company, and it is by their permission that I speak of it here. I think the particular method we are following was gotten up by Mr. Earnshaw, formerly their chemist. Each day the gas is tested in the laboratory for the presence of naphthaline. Perhaps the details of this the chemist of the Company, Mr. Beardsley, had better give. We know each day the approximate amount of naphthaline in our gas, and it is in the form of a precipitate at the bottom of a bottle. The bottle contains a certain amount of liquid through which a given quantity of gas is bubbled. The same thing is done day after day, and as that precipitate increases we know that the naphthaline is increasing, and we try to take steps at the gas works to check the production. As it falls off we know that we are on the right track, and when it gets down to a certain point we know there is no danger of stoppage in our services. Now, I believe I am stating the fact, that we have not had in New Haven a single case of stoppage from naphthaline in over a year. It is only fair to say, however, that until recently we have made no coal gas; it has been all water gas. We are now making coal gas, and hope to make it in an increasing quantity, and whether we can reach the same results when our coal gas gets up to 50 per cent. or over I do not feel sure, but I hope we may be able to do so. Certainly it is a very great comfort to me, and I think I can say to all the officers of the Company, to know we are working along producing the same quantity of naphthaline which will give us no trouble, or that we are increasing, and long before it makes trouble in the services we can take steps to check it, or that we are going down hill and the naphthaline has lessened. It is a very simple operation. Anyone can perform it. It is merely a matter of perhaps 10 minutes' time, and I believe in it thoroughly.

The President—That is very good news brought to us by Mr. Nettleton, and it will be a great pleasure to the Association if Mr. Beardsley will kindly describe the detail, stating how the naphthaline is prevented from going into the mains or is removed from the gas.

Mr. Beardsley—Mr. President, the operation is a very simple one. A solution of picric acid in water is made up of a strength not quite saturated, the reason being that if you make a saturated solution, and the temperature at which you use your solution is low, the solution is liable to deposit crystals of the picric acid itself which may deceive you into thinking there is naphthaline present. Take this picric acid solution, of a lemon color—at New Haven we use 100 cubic centimeters of it in a bubbling bottle - and pass 5 cubic feet of gas through the solution. That is really all there is to it. If there is any naphthaline in the gas it will produce a sort of flaky precipitate which will settle down to the bottom. We do not attempt to determine that precipitate as regards quantity ordinarily—that can be done, but it is a rather lengthy and tedious operation and is not worth while. You merely estimate

the amount by your eye, and from knowing what it has been in previous workings you know whether it is increasing or not, and whether it is liable to make trouble. It is merely a rough, approximate test. There are some precautions to be observed in making it. The gas must be perfectly free from tar. If you wish to make the test on gas that contains tar you can fill a tube with cotton and pass the gas through that first. There is another precaution to be observed, too. You must avoid the use of rubber tubing between the cock from which you draw your gas supply and the bottle. I found stated in a note in the English *Journal of Gas Lighting* that 2 feet of rubber tubing would completely remove the naphthaline, the latter then being in quantity of from 6 to 10 grains per 100 feet, from gas passing through the bottle at the rate of about half a foot to a foot per hour. Consequently it is absolutely necessary to avoid rubber tubing connections. We do this by making glass tube connections, and using only enough rubber tubing to join the pieces of glass. I don't think of any other points in connection with the tests, but I shall be very glad to answer any questions.

The President—After the test is made and the naphthaline is detected what do you do?

Mr. Beardsly—Mr. Nettleton can tell you better about that.

The President—Assuming that the proportion of the naphthaline is in excess of what you would like, what is the next step, Mr. Nettleton.

Mr. Nettleton—We make changes in the operation at the works. If our heats are high we drop them. We have found that we could remove naphthaline by bubbling through ammonia water to some extent; at least, we could lessen the amount. I think it is no secret that you can remove naphthaline with hot water gas tar that does not already contain naphthaline. Then there are several solvents. There are a number of patents which are being brought out in England at the present time. There are a great many things that will remove naphthaline, but the trouble is that most of them will remove the other hydrocarbons at the same time, and you lessen your candle power. The main thing, and the thing that I wanted to emphasize, was the method that Mr. Beardsley has just described of knowing of the presence of naphthaline in the gas—and the approximate quantity.

The President—At what point in the works, or in the distribution, is this sample of gas tested for naphthaline? Right from the hydraulic main?

Mr. Nettleton—At the office, ¾ of a mile away from the works. It is also tested let me say on the top of the last purifier at the works. That guides the engineer of the works, and the foreman. But the test I think on which we all rely most is that made at the office.

The President—Now, Mr. Nettleton, assuming that you found an excess of naphthaline present at the office, at what point would the remedy be applied? What is the remedy and how is it applied?

Mr. Nettleton—In making coal gas, if we had high heats we would drop the heats. By more efficient bubbling through ammonia water we have reduced the naphthaline. Those are the only two things that have been used so far. If naphthaline is produced in water gas then it is a simple question of heat in the water gas apparatus.

Mr. Klumpp—As most of the naphthaline is made in coal gas I might suggest a plan that has been used by some companies with more or less success, especially in a mixed gas works. That is, to introduce light water gas tar instead of water in the coal gas scrubber. You will find that it will take out considerable quantities of naphthaline without robbing the gas of its illuminants. This tar can be tested for naphthaline, and when it becomes saturated it can be dumped into the tar well and sold with the balance of the tar, and a fresh lot taken for the scrubber.

The President—What would you do in the case of a company that made no water gas?

Mr. Klumpp—A coal gas plant might buy water gas tar very cheaply, and sell it in with the coal gas tar.

The President—How many gallons of the water gas tar would be necessary for 1,000 feet of coal gas?

Mr. Klump—I have no figures on that, Mr. President. I don't think it is necessary to do it continually, but any time when cold weather comes on it might be very efficient for one or two months' service.

Mr. Wood—I would like to ask the gentleman if he would use an independent scrubber in that case, or the same scrubber he uses to take out his ammonia, and if so, whether the tar would have any effect on the extraction of ammonia?

Mr. Klumpp—I think it should be put after the ammonia scrubber and should be an entirely separate scrubber.

Mr. McKay—Can Mr. Klumpp tell us the temperature at which the coal gas should be treated in this way, and the temperature at which the tar should be admitted?

Mr. Klumpp—I have not any figures of temperature, but I think it should be 75° to 80°.

Mr. McKay—For the gas?

Mr. Klumpp—Yes.

Mr. McKay—And the tar?

Mr. Klumpp—About the same. We simply circulate it without heating it at all, and allow it to take up its own temperature, except in winter when it should be brought up to the above temperature.

Mr. McKay—You don't return the same tar a second time?

Mr. Klumpp—We circulate the tar right from the lower tank to the top of the scrubber, and through the scrubber back to the tank again, continuing that until the tar is so saturated that it will not take any more naphthaline, then put in a fresh sample. I might add, Mr. President, that when we were short of tar we tried gas oil with good effect. We used gas oil instead of tar, then made gas out of the oil.

The President—Is that Pennsylvania or Texas oil?

Mr. Klumpp—Pennsylvania, or Northern oil.

The President—You have never tried the Texas oil?

Mr. Klumpp—There is a little too much sulphur.

Mr. McKay—What was the effect on the oil after that process?

Mr. Klumpp—The quantity was so small in proportion to the rest of the oil that the absorbed naphthaline did not affect the quality of oil to any extent. This naphthaline would be broken up in the water gas set at any rate. The naphthaline scrubber would be installed on the outlet of coal gas only.

The President—Will Mr. Barnum tell us of the experience, if there has been any, in Worcester? Mr. Allen, have you had any trouble in Brookline more than we all have had?

Mr. Allen—Not lately. We are not making any gas.

The President—You are making no coal gas there now?

Mr. Allen—No, sir; I have not made coal gas for 10 or 12 years.

The President—I thought the testimony showed that there was a coal gas plant kept in commission.

Mr. Allen—Not at Allston. We have a water gas plant only.

Mr. Nute—I should like to ask Mr. Klumpp what kind of a scrubber he would recommend.

Mr. Klumpp—It was simply a tray scrubber, Mr. President, with a spray on top, and we pumped the tar in through the water spray. I believe it has been used in a coke scrubber.

The President—The Secretary has some testimony to offer.

The Secretary—I think Mr. Allen, of Brookline, gave the only complete solution of the problem, and that was, don't make any gas. I noticed in the AMERICAN GAS LIGHT JOURNAL the other day specifications for an upright retort, and among the claims made was it would produce no naphthaline. Perhaps when you get to using upright retorts the trouble will be solved. I think the claim was based on the fact that the gas would come out through the middle of the charge, and not come in contact with the heated walls of the retort, and, therefore, would produce no naphthaline. In connection with the drying process which was mentioned in Mr. Egner's letter, I might say that I am informed that the Suburban Gas and Electric Company, which does business in the towns of Winthrop and Revere, Mass., had no stopped services from either naphthaline or frost, or practically none, but gas supplied from the same holder I have good reason to believe has caused naphthaline stoppages and frost stoppages during the last two winters. The gas is the same when it leaves the holder, but for some reason or other when it reaches the consumers' services it seems to act better in one locality than in another. The gas passes—some of it—through I think nearly 6 miles of main before it finally gets to its destination, and across a bridge, and my only theory is that the conditions favorable for the deposition of naphthaline have been removed before it gets to the Suburban Company, and I am quite sure they are not removed in East Boston.

The President—Can any other members give instruction or testimony in this direction? I can say, in a line with the statements made by the Secretary, that it is a fact the gas supplied under high pressure from North Adams to the towns of Adams and Williamstown, each 6 miles under the high pressure, has given no evidence of naphthaline, nor have we had in those 2 towns any stoppages by frost in services, and we have an average from one-half to a whole candle power better gas in those two places than we have in North Adams, supplied under a pressure varying from 5 to 10 or 12 pounds. That is a peculiar fact, but the moisture is entirely removed from it, and we have not had stoppages in those two places. In North Adams, where the gas is all made, we have had an average of 6 a day during a month, and not one in the other two places.

Mr. Gould—I think there may be some virtue in coke oven gas that

you have not heard of. With our 50,000 meters I think we have not had a case of naphthaline for three years. I think it was three years ago last October that one of the condensers was out of service over at the works. There were a very few cases at that time, but I don't know of a case since, with about 50,000 meters in use.

(To be Continued)

[Concluded from Page 449.]

ABSTRACT OF PROCEEDINGS, FOURTH ANNUAL MEETING, WISCONSIN GAS ASSOCIATION.

Held in the Hotel Pfister, Milwaukee, Wis., Feb. 15 and 16, 1905.

Second Day, Morning Session.

The technical business of the Association was declared finished at the noon adjournment of the second day. The final paper, according to our reporting, was the following, by Mr. Bryce McAdam, of the engineering staff of the Milwaukee Gas Light Company, entitled,

DISTRIBUTION PICKINGS.

Over a year ago I promised our Secretary, Mr. Hyde, that I would endeavor to prepare a paper on Milwaukee's distribution system for the 1905 meeting of this Association, fully expecting that the contemplated improvements in our distributing system would be completed in time for the preparation of such a paper; but unfortunately such was not the case, and the paper will be limited to the little that is done, what is to be done and perhaps a little on the side.

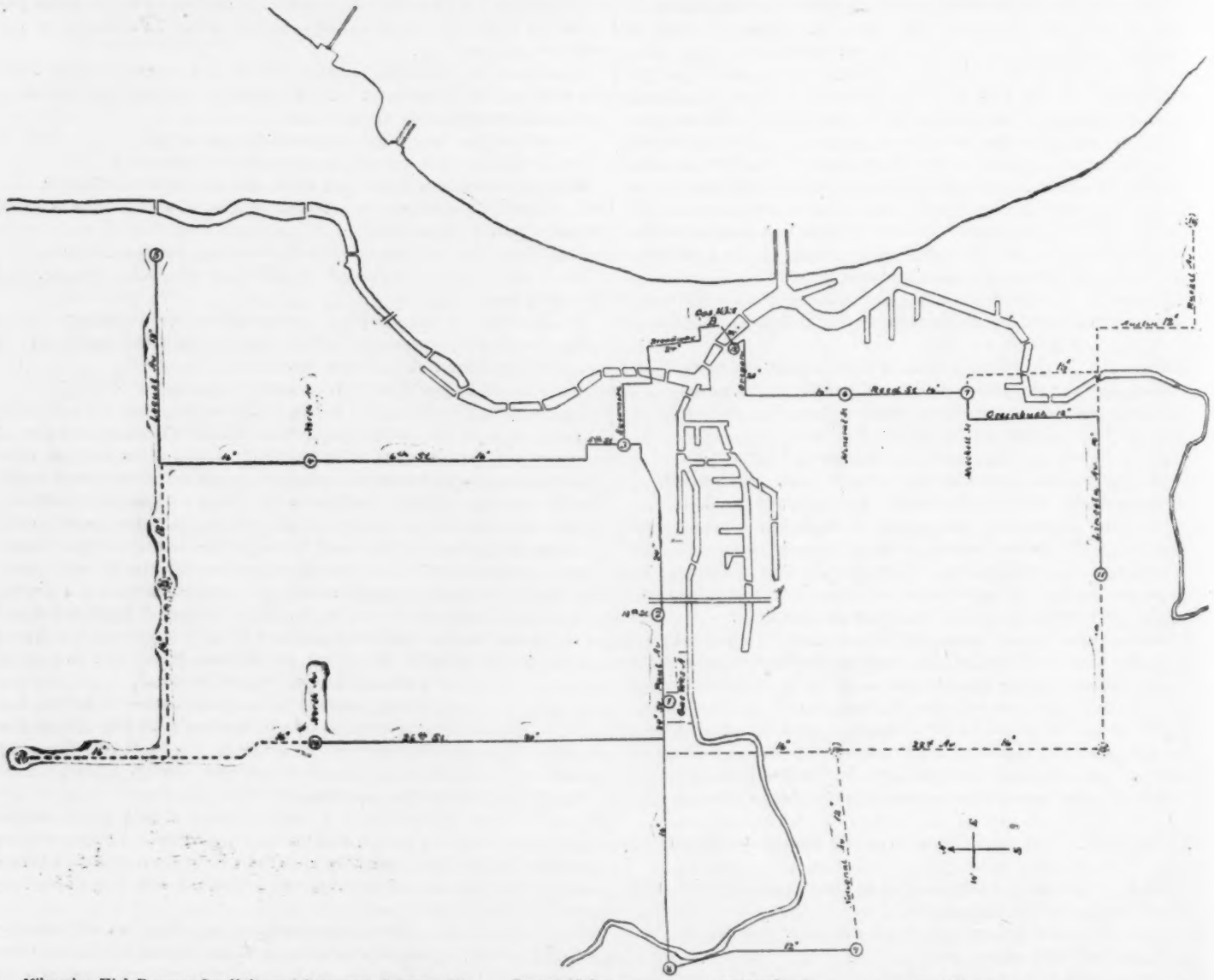
About five years ago the Milwaukee Gas Light Company came to the sudden realization that its distribution system was certainly inadeqnate for the fast growing demands of the city and that something must be done, and that immediately. The question then was what will be the best way to do this?

For a few years previous the Company endeavored to take care of the increasing demand by enlarging its mains at different points in the downtown district and near to the base of supply. This served as a slight improvement for a time, but it was soon found out that the outlying districts received no benefit from this outlay; the demand in the downtown districts kept steadily increasing and any reasonable increase in pressure was consumed by them, and the outlying districts received no benefit whatever. Conditions were such that it was no uncommon thing to carry 8 and 10 inches pressure on our blower at the old works B. during the hours of heavy consumption, and this on an ordinary low pressure line is out of the question.

We had at that time a line of pipe 24 inches and 30 inches which was laid to supply the new West Side holder, A., from the old works, B. This holder was expected to remedy the evil by giving us a supply through a newly erected governor at that point, No. 1, and also through two more governors, Nos. 2 and 3, erected at the same time (in the fall of 1900) on the pumping line from the old to the new works. This was a great improvement, and we were confident that the problem was solved and all interested felt a great relief.

Governors 1, 2 and 3 were called the Milwaukee governor, designed by our Mr. Unger, and were in a small pit with the working or adjustable portion above ground in a booth similar to those used as patrol boxes and standing at the edge of the sidewalk. They were automatic so far as retaining the pressure they were set for, but at the hours of heavy consumption an attendant was stationed at each one to raise the pressure to the desired point. No. 1 has since been changed to Connelly governors.

Our joy was short-lived, for it just took one more year to show us we were not yet keeping pace with the demand, so some other way out of the difficulty must be found. About this time our then General Manager, Mr. E. G. Cowdery, and Mr. R. B. Brown formed an aquaintance which ripened to the extent of Mr. Brown's being installed among us



Milwaukee High Pressure Gas Mains and Governors, January, 1905. Present Mains: ———. Contemplated: - - - - -. One Mile: ——————————.

as our engineer. This of course meant another head for our troubles to fall on. Mr. Brown's peculiar way of suggesting things leads one to try them, and I think Mr. Cowdery fell a victim to the suggestion that we abandon all thought of enlarging anything downtown, or any where else on our low pressure mains for the present, and proceed at once to install a system of pumping lines with governors at different points, and gradually form a circuit of the city with such a system. This we immediately laid plans for and began as follows:

In the year 1902 we laid a line of 16 inch, from a point at No. 3 to a point at No. 4, and erected governors there, which proved a success. In the same year we converted into a pumping line, a line of 16-inch, running from No. 1 to a point at No. 8, erecting governors there and from thence, to a point at No. 9, with a new line of 12-inch and erecting governors there. No. 8 takes care of the supply going to the town of Wauwatosa. Like the previous work done on the system everything was satisfactory, and in 1903 we laid a line, half of 16-inch and half of 12 inch, from No. 4 to a point at No. 5, erecting governors there, and also connected a line, composed of 20-inch and 16-inch, running from our old works, B., to points 12, 6 and 7, erecting governors there, which work was also highly satisfactory. In 1904 we laid a line of 20 inch, from a point west of No. 1 to a point at No. 10, erecting governors there, and the same year a line composed of 12 inch and 10-inch was laid from No. 7 to a point at No. 11, erecting governors there.

We have in use to-day a total of 13 miles of pumping mains for distributing purposes.

The distance from	No.	3	to	No.	4	is.....	8,827	feet.
"	"	"	"	4	"	5 ".....	9,400	"
"	"	"	"	1	"	8 ".....	6,340	"
"	"	"	"	8	"	9 ".....	5,286	"
"	"	"	"	1	"	10 ".....	10,500	"
"	"	"	"	B	"	6 ".....	6,500	"
"	"	"	"	6	"	7 ".....	2,000	"
"	"	"	"	7	"	11 ".....	8,200	"

All governors, excepting Nos. 1 and 2, are Connelly balance governors, two in each pit, set tandem. Nos. 4, 5, 6, 7, 9 and 10 are 12-inch governors; Nos. 8 and 11 are 6-inch governors, fitted up in such a manuer that they can be replaced with 12-inch in a few hours. The inlet governors have a plate fixed on valve shaft to hold the weights for adjusting. These weights when once placed are not changed. On the outlet governor counter-balance arms are used in the usual manner. The inlet governor is set for 5 inches pressure, and the outlet governor for 2½ inches. The object in having two governors is to relieve the outlet or working governor of the high pressure carried at certain hours of the day, so that in case of accident to that governor the heavy pressure would not be thrown on the district.

The first governor is fitted for a mercury seal and the second for glycerine; a by-pass arrangement is also in each pit. There are three Bristol recording gauges in each pit, one on the inlet, one between governors and one at the outlet. The first has a 30 inch chart, the second a 12-inch and the third a 5-inch chart. These are 7-day charts and are changed and brought to the office once each week, all on the same day.

The blower is a Roots, with a 30-inch inlet and 24-inch outlet, driven by a 100-horse power engine located at the pumping station of our works, A. We have found 20-inch pressure to be sufficient at the blower during the hours of heaviest consumption, but expect to be called upon to double that in the next few years. The holder when full gives 9½-inches, and that is sufficient during the hours of ordinary consumption.

Our governor pits are 7 feet 8 inches by 12 feet 4 inches with a 12-inch brick wall laid with cement mortar on a concrete bottom 8 inches thick. The roof is concrete, arched on 9-inch I-beams, finished 4 inches below the grade, on top of which is a dry mixture of crushed stone and gravel forming a macadam road. In one corner of the roof (nearest to where the gauges are) is placed a square manhole with a locking device, and counterbalanced so that when the cover is unlocked and raised it remains standing on end until again closed and locked. The work done so far has been entirely satisfactory and we will go on extending the system, as demanded by an increased business.

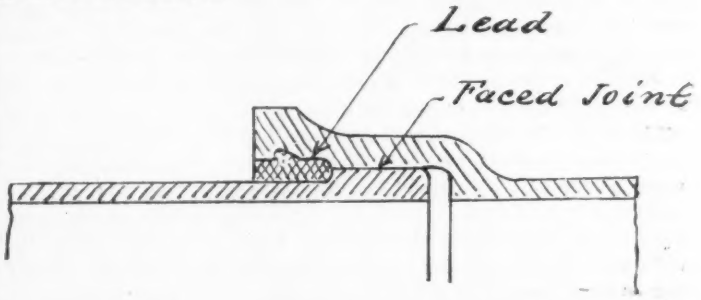
The contemplated extensions are to run north from No. 10 to No. 17, then east to connect with our present line, erecting governors at No. 13, thus completing the circuit on the West side. The governors No 5 are fed into a 12-inch main crossing the river over the viaduct, taking care of the upper portion of the East side; the old plant B, also supplies the East Side. A line will also be run from No. 9 this year, east to a point at No. 14, erecting governors there, which line will be connected to another that will be run on a viaduct about to be erected by the city over the Menominee Valley, connecting the North and West Sides with the South Side, beginning at a point west of No. 1 and continuing south to No. 15, erecting governors there, and from thence east to connect at No. 11, thereby forming a complete circuit of the South and West Sides from the new plant A, to the old plant B. This, with the addition of a single line to be run from No. 7 to the southeast section of the city, with a governor at No. 16, will give us a distribution system second to none in this country.

Our mains are the ordinary standard, cast iron, laid with lead joints and with the best of care. No leakage has developed on the entire system and none is expected. Like all others, we have the prevailing disease, namely, dead ends. This is a matter that should receive more attention than is generally given it by those in charge, and our General Manager has signified his intention and determination to close all the gaps before the end of the present year, and thus lend material aid to our plans.

Our distribution or street department work varies little from the rules elsewhere. Our mains are standard cast iron with lead joints, excepting a small stretch of Universal pipe put in on trial. It is the intention, however, to try cement joints this year. They seem to be a success wherever used, and are certainly cheaper.

We have 1,000 drips on our main system which are taken care of by three drip wagons, the drip pumpers reporting every day on blanks used for that purpose. We have in use 367 miles of main, giving one drip to every 1,937 feet. In the year 1900 we had 825 drips and 277 miles of main, giving one drip to 1,773 feet of main. Since 1900 we have laid 90 miles of main, and put in 175 drips, giving one drip to every 2,715 feet of main laid. The decrease is very satisfactory and can be attributed to two causes, that of doing the work more carefully and the tying in of dead ends on which were drips.

Before going further let me remark that in my opinion some of the British gas companies are ahead of us in the style of main pipe used, and I think that for pumping lines, such as adopted by the Milwaukee Gas Light Company or for ordinary distribution (especially large sizes) it is far ahead of our standard bell and spigot pipe, and I would gladly welcome its introduction into Milwaukee. The hub is slightly deeper than that made in this country, the inside of which has a projection 2½ inches wide; beginning at back of hub this is turned off with a perfectly smooth surface. The spigot has no bead but is cast with a projection conforming to that of the hub; this is also turned perfectly smooth on the face or surface, and fits snugly into the hub. When about to lay the pipe the faced parts are coated with a mixture of red lead, white lead and oil, the spigot end is carefully entered into the hub and driven home with a block of hard wood, by pounding on the hub of the length just laid until within ½ inch of being home. The pipe when thus laid is already almost perfectly gas tight, but a lead joint is also run in the usual manner on the part of the hub not taken up with the turned and bored joint. No yarn is used; it is not necessary. In the case of large sizes, after the pipe is properly entered it is left there until another length is lowered into the trench, and this length, while still hanging in the sling, is used as a ram to send the other length home, as shown in the sketch.



Last year we adopted two extremes in laying services, namely, those untarred and those laid in pitch. I have yet to find the man who can conscientiously say he has proven from experience or tests that the life of a service laid tarred is greater than that laid untarred. This may appear to be putting it rather strong, but it is a fact nevertheless. If the soil is such that it will injure the pipe, it will also find its way through any tar preparation, providing the preparation is put on by dipping or a brush. It was after a careful study of all these facts that our Engineer, Mr. R. B. Brown, was prompted to recommend that no pipe be dipped. All our services put under street car tracks in 1904 were laid in pitch, as follows:

A square box, made of 1-inch undressed lumber, 1 inch larger than

the outside diameter of the pipe, was laid in the trench extending 3 feet beyond the outside rails; in the bottom of this were placed, 6 feet apart, small pieces of wood ¼-inch thick, to keep the pipe off the bottom of the box and to allow the pitch to get under the pipe. In grading the service all necessary blocking was placed under the box. When the service was so far advanced the ends of box were closed with clay and hot pitch poured into same until same filled to the top, no cover being used on the box, as no filling was done until the pitch had cooled. The cost of laying in pitch was only $2 each more than others of the same length. This I believe to be the true solution of the problem of protecting service pipes from electrolysis and bad soil, but the services would be better boxed from main to curb or stopcock; this, of course, would add a little more to the cost. I fully expect to see all services laid in Milwaukee in the future protected in the above manner.

We lay nothing smaller than 1¼-inch pipe and have in use the following rules for tapping mains:

Three-inch main for 1¼-inch service, tap at 1-inch hole and use a service sleeve. Three-inch main for 1½-inch service, cut the main and put in tee. Four-inch main for 1¼-inch service, tap at 1 inch hole and use 2 street ells. Four-inch main for 1½-inch service, tap at 1½-inch hole and use service sleeve. Four-inch main for 2-inch service and larger, cut main and put in tee. Six-inch main for 1¼ inch service, tap 1¼-inch hole and use 2 street ells. Six-inch main for 1½-inch service, tap 1½-inch hole and use service sleeve. Six-inch main for 2-inch service and larger, cut main and put in tee. Eight-inch main for 1¼-inch and 1½-inch service, tap and use 2 street ells. Eight-inch main for 2-inch service, tap 2-inch hole and use service sleeve. Eight-inch main for 2½-inch service and larger, cut main and put in tee. Ten-inch main for 1¼-inch, 1½-inch and 2-inch, tap holes and use 2 street ells. Ten-inch main for 2½-inch service, cut main and put in tee. Twelve-inch mains and larger, holes up to 2½ inch can be tapped and 2 street ells used, but when services 3 inches and over are wanted special instructions are given.

We have in use quite a number of old 1-inch services, which we have been renewing gradually, but will start a general crusade against it this year keeping it up until not one is left.

When we have a complaint that the supply in a building is poor, and find the cause to be on account of a 1-inch service we immediately change it to 1½-inch. If it is proven beyond a doubt that a 1-inch service is too small we do not make it a little better by putting in a 1¼-inch, but make it a great deal better by putting in a 1½-inch.

You will notice from our rules for connecting services that we tread the old path in the use of 2 ells on top of the main. Where the main is tapped on the side no ells are used, and it is only in the last 2 years that the practice of using ells in side taps have been abandoned. No evil results have followed from this course, and candidly I fail to see any good grounds for tapping mains on top and using ells unless the other course is impossible. Some claim it is an advantage to use ells from the fact that should the main settle a little the ells will permit of a shift movement without breaking, yes, a mighty little movement, and granting it so, should the main settle just a little more something must give, and 2 ells won't prevent it; and let me say that when a main settles I want to know it, and prefer to have something break and apprise me of the fact rather than have it occur and with the kindly assistance of 2 ells hide it from me. Again, some claim that it enables the men laying the service to make connections much quicker and easier, being able to move the ells in any direction. This may be so if the men do not know how to tap the main properly, but from observation and experience I can safely say that where the hole is properly tapped the work is done quicker without the use of the ells; that is, assuming the main can be so tapped. In all my experience I have never known a service pipe to break or pull out of the main on account of no ells being used. When such a service did break or pull out it was caused by some accident, and had ells been used they would have gone the same way. The plug tee used instead of the ell in the main by some companies has been given no place by us. While it is all that it is claimed to be I fail to see any great need of it and it cannot always be used to advantage.

In Milwaukee we have not had occasion in 6 years to dig up on account of a stoppage a service that was tapped into the side of the main, but have many times had to cut off at ells and clean out obstructions deposited there after the meter department had attempted to clean them out. There is in my estimation some room for improvement in the manner of connecting services to mains, and I hope that soon someone will discover a better plan than any in use to-day, awaiting which we will go on committing a little of what I term a common error.

I may be subject to a good deal of criticism for my peculiar opinion, but nevertheless this is as I have found things and as they appeal to me. It was not my intention to write anything beyond our distribution plans, but trust what I have side-stepped on will bear fruit.

(Concluded from Page 452.)

Indoor Humidity.

By Henry Mitchell Smith, M.D., Brooklyn, N. Y.

Comfort Attends Proper Moisture.—Moreover, properly moistened indoor atmosphere lacks all the oppressive dry feeling so characteristic of the average artifically heated room, seeming more like the corridor of a well ventilated hotel. The quieting effect of such an atmosphere is striking. There is an indescribable sense of relaxation and "poise" constrasting strongly with the feeling of nervous tension so frequently experienced in overheated dry rooms.

It was satisfactorily proven that one may live during the coldest weather with perfect comfort in a room at 65° F. where the relative humidity is kept at about 60 per cent. During the experiments upon the sensations produced by different percentages of saturation and in order to obtain the opinions of persons having no knowledge of the existing conditions, one room was equipped with a moistening apparatus and the temperature kept at 65 to 68°, with a relative humidity of about 60 per cent. An adjoining room, without a moistening apparatus and heated by an ordinary steam radiator, had an average temperature of 72 to 74°, with a relative humidity of 30 per cent. In every instance and without at all knowing what the temperatures were in the two rooms, the opinion was unhesitatingly expressed that the first room was several degrees warmer than the second.

Low Temperature with Proper Humidity.—It has been mentioned that the feeling of comfort was greatest in a room at 65° with a relative humidity of about 60 per cent. produced by artificial means. It was most interesting and instructive in connection with this matter to find on the perfect days in May and early June, with all the windows opened, admitting freely the outside air, that the thermometer stood at 65 to 68° and the hygrometer registered about 60 per cent. relative humidity. A moment's thought recalls the fact that we often sit out of doors with perfect comfort at a temperature that would cause us to shiver in our rooms in the winter. The relative humidity is the balance wheel that regulates our comfort at different temperatures in still air. So repeatedly was this demonstrated that it may be accepted as a cardinal rule that if a room at 68° is not warm enough for any healthy person it is because the relative humidity is too low, in which case the procedure is to raise the relative humidity and not raise the temperature.

The heat absorbing properties of moist air in rooms operate directly to the advantage of the occupants, because the air is relatively still. We furnish by artificial means heat to keep the temperature of the air much nearer the temperature of the body than is the air out of doors, and a reasonable percentage of moisture (60 per cent.) in a room at ordinary temperature conserves the heat supplied by the heat source.

It is inconceivable that with otherwise perfect means of heating, provision for producing perfect moisture to maintain a higher relative humidity should have been so disregarded in all but those elaborate systems applicable only to large halls and public buildings, where with forced ventilation the air may be moistened in the main air ducts. But these systems, from the expense of installing and operating, are impractical in the ordinary home, thus leaving the great majority of us to live in an atmosphere of desert dryness, and depriving us of an element almost as necessary for health as a proper degree of heat.

Fuel Waste from Lack of Moisture.—That we are wasting fuel is evident at once from the unnecessarily high temperatures we maintain. The waste is probably greater than is generally supposed. Wilson says in the paper to which I have referred that "about 25 per cent. of the heating is expended in raising the temperature from 60 to 70°, so if we can keep comfortable at a temperature of 65° we shall have saved at least 12½ per cent. of the total cost of heating."

Various instruments may be used to determine the relative humidity, the wet and dry bulb thermometers being perhaps the most accurate; but for household purposes this form of hygrometer has the disadvantage that the relative humidity is not indicated directly, but reference to tables or else a somewhat complicated calculation is required. It has one point of considerable scientific interest, however, for the reading of the wet bulb thermometer is a very fair measure of the temperature that is felt by the moist surface of the body—that is to say the temperature produced by evaporation (which is always lower than the air temperature, unless the aqueous vapor is saturated). In an interesting

paper on this subject Professor Harrington of the Weather Bureau has termed the temperature produced by evaporation "sensible temperature," because it is the temperature actually felt by the surface of the body.

"*Sensible Temperature.*"—Now, given a room at 72° with a relative humidity of 30 per cent. and another room at 65° with a relative humidity of 60 per cent., the sensible temperature in each case can be determined from the psychrometric tables, and we find that in the first instance the sensible temperature is 55° (wet bulb) and in the second instance the sensible temperature is 57°, showing that the body surface temperature is 2° higher, at 65°, with a relative humidity of 60 per cent., than at 72°, with a relative humidity of 30 per cent.

A careful study of the fluctuations of the wet bulb thermometer, having in mind this term, "sensible temperature," shows that sensations of heat and cold conform much more closely to the readings of the wet bulb than of the dry bulb, as the following instance will illustrate: On a very hot day, in May, 1903, at 4:45 P.M., the dry bulb (air temperature) stood at 87°, and the wet bulb (sensible temperature) at 70°. The relative humidity indicated by these readings was 45 per cent. (unusually low for this locality). At 5 P.M. there appeared indications of an approaching thunder storm, which, however, passed around to the north and only a few drops of rain fell; at 5:15 the impression was that it had become very much warmer, but the thermometer showed 86° dry bulb and 73° wet bulb (relative humidity 53 per cent.) The air temperature was actually 1° lower, but the sensible temperature was 3° higher, which exactly coincides with one's sensations.

The above is so common in summer that everyone will have experienced the feeling of greater heat whenever a thunder shower fails to clear the air. We say in explanation that the humidity is higher, which is true, but the above figures show how much more graphically the actual conditions are represented by the readings of the dry and wet bulb thermometers than by expressing the relative humidity in per cent. The surface of the body is analogous to a wet bulb thermometer and the term "sensible temperature" deserves a prominent place in our nomenclature. It is easier to "take cold" in a room at 72° with a relative humidity of 30 per cent. than in a room at 65° with a relative humidity of 60 per cent.

Hygrometers Needed in Homes.—A reliable hygrometer should be in every household and should be watched to see that proper conditions are maintained. An instrument for registering the percentage of moisture is as important as an instrument for registering the temperature; perhaps more so, for with a proper percentage of saturation of the aqueous vapor we may more safely trust to our feelings of comfort regarding the temperature.

For practical purposes the hair hygrometer, or Lambrecht's polymeter, is a most satisfactory instrument, combining as it does a thermometer and a dial, from which the percentage of relative humidity can be easily read. Comparison of one of these instruments for over a year with the calculation made from the readings of the wet and dry bulb thermometers has shown it to be very accurate. The importance of indoor humidity from a hygienic and therapeutic standpoint can hardly be overestimated, and a paper could be written upon this phase of the subject alone. Generally speaking, dry air is an excitant, often causing sleeplessness and irritability, accompanied with a drier skin and quickened pulse. Moist air is more of a depressant, producing quiet sleep and slower circulation of the blood.

Air Moistening Apparatus.—Moistening apparatus have been in the main unsatisfactory, because their control has not been independent of the control of the heat source. It is amusing to find that in spite of the advantages of a moisture atmosphere indoors objections have been raised against the use of devices for this purpose, on the ground that when the weather is very cold moisture condenses upon window panes. It is true that this will happen; it is a natural and logical result of proper conditions. We can all remember that before the days of heating by direct radiation it was usual to see frost on the window panes in winter, a condition we now never see with the extreme dryness that our present direct heating systems produce. The fact that condensation does not occur is sufficient evidence of the indoor "dryness." The relative dryness of the average indoor atmosphere in winter is so unnatural and so unhygienic that its correction should receive the serious consideration that the subject merits.

We who live in houses heated in the ordinary manner are responsible for the conditions that prevail, because we have not demanded more hygienic methods. If the subject does not appeal to us upon the ground of health it should upon the ground of economy and comfort. If we would preserve our furniture, books, pictures, etc., from the ravages of artificial heat we must contrive some means of controlling this low relative humidity. After living in rooms with a lower temperature and proper relative humidity no one will be satisfied with the other conditions.

SPECIAL ENGLISH CORRESPONDENCE.

COMMUNICATED BY NORTON H. HUMPHRYS.

SALISBURY, ENGLAND, March 10th, 1905.

Casualites in Gas Works.—Status of the Industry.—The Commercial End of the Gas Industry.

The fact that some five or six casualites, attended with loss of life, have occurred in gas works or in connection with the industry during the last 6 months, has naturally directed attention to the risks of accident that obtain under the ordinary operations incidental to the manufacture, purification and distribution of gas. Familiarity breeds contempt, and perhaps the first impulse is to dismiss the question with the assertion that there always will be risks, and that gas workers cannot expect to be packed up in cotton wool. Admitting that gas works are by no means the most hazardous of manufacturing premises, that is no reason why every reasonable precaution should not be adopted, and there is nothing of a foolishly sensational character in a plain consideration of the principal causes of accident, as evidenced by actual occurrences, and the methods to be adopted as palliative of prevention. And if such methods are simple and inexpensive, it follows that the engineer who neglects them has not a due consideration for his own credit nor for his employer's pocket. To put the matter on the lowest platform, that of self-interest, an accident is sure to be costly. So every manager of gas works may with advantage look round and see if such an accident as the blocking of the pipes in any part of the apparatus between the retorts and the gasholders, or the tilting of a governor bell, would be likely to be attended with serious results. There are many, one might almost say 9 out of 10, works that are run with absolutely no provision in the way of a safety blow-off, or with naked lights in the governor and engine houses, although it would be a simple matter to put in 2 or 3 blow-off seal boxes in suitable localities, or to inclose the lights. Even such a simple precaution as putting legible labels on all valves and apparatus might save considerable confusion and danger. There are many works where the working of the valves is left to one man, and it is customary to depend more upon his experience than upon any organized plan. This condition of affairs is not improved by the fact that in the course of years the original plan of the works has been considerably altered by the removal of some apparatus and the introduction of additions, with the result that what was originally a neat, orderly arrangement has become more like a chinese puzzle. Very likely something can be done in the way of simplifying, making one valve answer the purpose of two, or replacing three slide valves with one 4-way. The same applies to the overflow or drip boxes. It is rather awkward in case of emergency to have to depend on the recollections of Harry, who altered the pipes 20 years ago, or of Dick who happend to be on the job when they were uncovered about 10 years back. No doubt there are plans in the drawing office but these cannot always be found when wanted. But in every case the working of the valves and the location and dimensions of the overflows should be known to more than the manager and the foreman. Enamelled noncorrodible labels are readily obtainable, and one on each valve and over each seal box would enable the principal workmen to acquire a reliable knowledge and lead to avoidance of disagreement or confusion when anything goes wrong. In several gas works there is a by-pass with an automatic or safety governor, between the main inlet and outlet, to guard against accidental stoppage of the supply. This idea might be extended to other parts of the apparatus. And with regard to gasholders, inlet and outlet valves, purifier valves and other series in which it is imperative that one of the set should be always open, it is a good plan to provide a suitable movable label that is always kept on an open valve. When changing holders for example, from No. 1 to No. 2, the valve to No. 2 is first opened, the label moved from No. 1 to No. 2, and then No. 1 is closed. This entirely precludes the possibility of accident due to inadvertently closing No 1 before opening No. 2. Where there are more than 4 purifying boxes or gasholders, each should have a distinguishing number and a board should be placed in a prominent position showing the apparatus at work and the order of sequence.

The reports presented at the meetings of shareholders, on the results of working during the 6 months ended December 31 last, are without exception of a highly satisfactory character. Increased sales and reduced working expenses are the general order and perhaps the only fly in the ointment is the low price of coke and tar. The mildness of

the past season no doubt accounts for the former, but why tar should go down to a merely nominal price is not so evident. Looking at the number of valuable constituents that are extracted from it, one cannot understand why it is more profitable to use tar as a fuel, for tar pavement, as a rough paint, or in fact for any purpose other than dispensing of it to the distiller. The demand for automatic meters and cookers continues unabated, and many companies have as many slots as ordinary meters, and one undertaking, I notice, has nearly twice as many. There is a very marked advance in the use of incandescent burners, which has been encouraged by the adoption of maintenance systems and also by new patterns of inverted burners. The economy of the system attracts some, and its efficiency draws others. As a result the ensuing season may be expected to be a busy one in the matter of extensions, and these will embrace many new processes and machines. A feature of the Earl's Court exhibition, which did not appeal very strongly to the public, but which nevertheless had a great attraction for the practical man, was the machinery department, and it will probably lead to the placing of many orders. In fact, that department was in itself a striking evidence of the importance and magnitude of the gas industry, and many who inspected it will not rest satisfied to shovel and wheelbarrow, but adopt some form of conveying machinery for the transfer of coal and coke, and for the charging and discharging of purifiers. And with the prosperous lines above indicated, the sinews of war will not be withheld. Nor have the interests of the consumer been neglected, for in several cases reductions of price are announced.

The introduction of incandescent light means a reduction in consumption of gas to the extent of one-half or two-thirds. A "C" Welsbach, using 3½ cubic feet per hour, takes the place of two 5-foot flat flames, or a No. 2K using 2½ cubic feet per hour, puts out 1 flat flame. The committees of many churches and public buildings are congratulating themselves on this fact, and yet it is remarkable that the gas companies do not experience unpleasant evidence of it. The reduction of consumption thus caused is certainly more than that due to the electric light, and there must be some compensating causes to cover it. The sales' ledgers of the Welsbach Company and other makers of incandescent gas burners afford one reason. The analysis of gas accounts in the matter of new business furnishes another, for it will usually be found that the increased sales are in a less proportion than the addition to the list of consumers, and users of gas stoves. This matter will adjust itself in a year or two, and then, with no leeway to make up, the supplies of gas will experience the full benefits of their extensions. At present it is necessary to take this factor into consideration in estimating progress of the gas industry either individually or collectively.

Mr. S. Meunier made a remarkable departure from established precedent in his inaugural address to the Manchester District Association of Gas Engineers, by confining himself to the commercial side of the question, in submitting what he very modestly describes as some ideas upon a few of the more important commercial points, and an endeavor to throw some little light on the vexed question of paying and non-paying business, and the prices to be charged to the various classes of consumers in order that each should bear the proper quota of the necessary expenses. In one sense the subject is not original, for there are few Presidential addresses that do not include some incidental references to sales and prices. But these touch on one or two points only, such as discounts for cash or the sale of coke. Mr. Meunier is known to have made a special study of this branch of a gas engineer's business, and as the pioneer of the commercial section in the Manchester Institute. And he is also entitled to the credit of being the first to make a systematic review of the whole balance sheet. In his address he discourses on the purchase of coal and other materials, on wages and salaries, on maintenance of works and plant, and rates and taxes, on the selling of residuals, and on discounts on the price of gas. And this leads up to some accounts of the commercial section and the work to be done by it. One cannot but be struck on reading his well digested remarks with the fact that the time has now arrived when it is necessary that very much broader views should be taken of the duties of a gas manager. And it must be remembered that the scope and extent of such duties are to a very great extent fixed by the directors. There are those who seem to think that gas managers have an absolutely free hand and an entire control over the destinies of the industry, and claim that they should establish classes and offer facilities for students, conduct researches and investigations and other public works, overlooking the fact that they cannot do more than a very limited amount in this way, without the full support and countenance of their several employers. Perhaps there are not many left of those who regarded the association meeting as merely a bean feast. But there is still a widespread opinion in favor of making the manager put in a square 10 hours a day on the works and district, and of culling down the staff to the lowest possible limit with the result that the whole of his spare time is required for attending to correspondence, interviews with customers, and other detail work that could be as well done by a clerk. In this direction, I think, is to be found the true explanation of the neglect of the commercial side and of the prevalence of a "get rid of the coke with as little trouble as possible" sort of system. To the same cause may be contributed the isolated condition which leads neighboring undertakings to compete, unwittingly against each other, with the result that A dumps a surplus job lot of coke at B, to the detriment of B's already overstocked trade, while at C only a few miles off there is a good opening for further supplies. As regards purchase of materials A must be an exceptionally keen buyer if he can manage to get the lowest prices for everything, independently of a comparison with the prices paid by B and C. But if he gets a broad hint from his directors that they pay his salary and expect him to devote his full attention to their affairs according to their point of view, what is he to do? Papers read at gas engineers' meetings only touch the fringe of the immense amount of technical, commercial and general information that is at present confined to individual undertakings but which cannot be rendered available in the absence of a much wider and more liberal spirit than at present prevails, not prominently amongst engineers and managers, though there is room for improvement in that direction, but in the board and committee room.

ITEMS OF INTEREST FROM VARIOUS LOCALITIES.

THE proprietors of the Lewiston (Me.) Gas Light Company have notified their customers that until further notice, the gross selling rate will rule at $1.50 per 1,000 cubic feet, the payment of accounts within the first 10 days from billing to entitle the user to a rebate of 10 cents per 1,000. A net rate of $1.40 per 1,000 cubic feet in Lewiston makes us think that the management of the plant is in effective hands, for it is not so very long ago that the Company was charging $2 per 1,000.

FURTHER confirmation of the report that a new gas plant (that is, one to take the place of the old) is to be constructed at La Porte, Ind., comes from Mr. Fred. W. Freese, of Fort Wayne, Ind., who says he has been awarded the contract for such construction. In the contract list is named two ½-depth regenerative benches of 6's, complete condensing, scrubbing and purifying apparatus, a station meter and a 2-lift holder, of 100,000 cubic feet capacity.

MR. SAMUEL TRUMBORE, Easton, Pa., writing to the JOURNAL under date of the 21st inst., says:

To the Editors AMERICAN GAS LIGHT JOURNAL: After reading the proceedings of the New England Association of Gas Engineers, as printed in your issue for the 20th inst., I must say I perfectly agree with the thoughts put forward by Mr. C. F. Prichard respecting the use of coal tar for firing benches. In my belief the success attending the employment of coal tar for heating benches depends largely on the system used for regulating the supply of the fuel. I have had much experience in this line, and eventually I devised a regulator that filled the bill for me. After the proper supply adjustment was determined, the regulator needed no attention for 24 hours. My experience with tar as fuel satisfied me that with it regular heats could be maintained, and that the retorts lasted longer consequently than when fired with coke! We cleaned up the firing places once a week. When coke was selling at 8 cents per bushel tar was worth as a fuel $2 per barrel.

"H. W. J.," writing from the Chemical Department, Barrett Manufacturing Company, Philadelphia, Pa, says:

To the Editors AMERICAN GAS LIGHT JOURNAL: We note in your issue of March 20th, the very interesting paper, by Dr. H. B. Harrop, on "Gas Works' Chemistry." On page 445, however, some values for benzols are given, which must refer to minute quantities purchased from dealers in chemical supplies, and not to commercial quantities. A perfectly pure benzol or benzene can be purchased in this country in single barrels at about 35 cents per gallon. The same is also true of the pure toluol or toluene. As to the commercial article it is considerably cheaper. Highly refined benzols especially prepared for gas enriching can be obtained at very much lower figures, so that these materials, instead of costing from 65 cents to 85 cents per pound, can be obtained at from 4 cents to 5 cents. As these benzol products are being used in constantly increasing quantities we felt that the figures given were misleading to those who might contemplate the use of those materials.

A CORRESPONDENT in Chickasha, Ind. Ter., writing under date of the 17th inst., says: An item of interest for you is this: The Chickasha Gas Company has been organized here, and its officers are: President, A. T. Humphrey, Guthrie, O. T.; Treasurer, Lawrence Morton, Woburn, Mass.; Contracting Engineer and Superintendent, R. W. Kelly, Atchison, Kas. The plant will be finished in about 2 months, and the proposition is to then have in working order a first-class, up-to-date coal gas works. The outfit includes a suitably capacious storage holder set in steel tank, and the benches are to be of the regenerative type. Eight miles of mains are to be placed. The Kerr Murray Manufacturing Company, of Fort Wayne, Ind., will furnish the holder and machinery, and the Laclede Firebrick Manufacturing Company is installing the benches. It is quite sure that the works will be in going order by June 1st.

IN the changing over of the La Porte (Ind.) Gas and Coke Company, which has been purchased by Messrs. Child, Hulswit & Co., of Grand Rapids, Mich., the corporate name will be the La Porte Gas Light Company. The overtakers propose to capitalize the new concern in $200,000, and to bond it for $160,000.

MR. FREDERIC EGNER, in a communication to us, dated Norfolk, Va., the 21st inst., remarks:

To the Editors AMERICAN GAS LIGHT JOURNAL: Reading in your issue of the 20th inst., the proceedings of the New England Association of Gas Engineers brought to my mind strongly a suggestion made by me a few weeks ago to a friend, that I thought a bureau of the archaeology of the gas business might be instituted by some of our Greater Gas Associations with excellent results in the direction of real development in the art of gas making. In the proceedings mentioned, considerable time was devoted to a question, one which our respected friend Mr. F.C. Sherman, of New Haven, fittingly described as thoroughly threshed out long ago. That progressive gas man and completely experienced business manager, Mr. C. F. Prichard, of Lynn, Mass., evidenced in his remarks during the discussion that which Mr. Sherman declared; and so did Mr. B. J. Allen. Indeed, if anyone in need of information on coal or water gas tar for fuel would consult the proceedings of the New England Association, or examine the files of the AMERICAN GAS LIGHT JOURNAL, he would, beyond a doubt "get wise" on the subject through finding out all he wanted to know. Thus, having been informed up-to-date on the subject he would not have to rake over the cinder pile of the past decades, but could devote his energy and probable experience to really improved methods of the present day and advance the same, as the old guards did in their day and time. The writer begs leave to mention that more than 20 years ago he made thorough and careful tests, of long duration and on a large working scale, to determine the value of tar as a bench fuel. Briefly stated, the findings were that 1 gallon of tar is equal to ⅓ bushel of coke in a free firing bench. * * *

MR. F. S. NORTH, Secretary and Treasurer of the Downingtown (Pa.) Gas Company, has a pretty stiff proposition before him in the shape of fixing up the distributing system.

AT a recent meeting of the Board of Public Works, Fort Wayne, Ind., the proprietors of the Fort Wayne Gas Company presented the terms of a franchise under which they would be willing hereafter to supply artificial gas to the city and its inhabitants. Summed up the rate proposition is as follows: $1 per 1,000 cubic feet until the consumption exceeds 3,000,000 cubic feet day; 90 cents per 1,000 until the consumption exceeds 4,000,000 feet per day; 80 cents per 1,000 thereafter. The terms look all right from a manufacturer's point of view.

THE proprietors of the Lebanon (Pa.) Gas Company have filed a bill for an injunction against the Lebanon County Light, Heat and Fuel Company, to restrain the same from furnishing gas for lighting purposes through the mains which the latter is about to put down, from the coke making plant at North Lebanon to the plant of the American Iron and Steel concern.

A SPECIAL meeting of the Gas and Electric Company of Bergen County, N. J., is called for to-morrow, for the purpose of ratifying the amended loan and morgtage of its properties to the Public Service Corporation of New Jersey.

THE Public Service Corporation's gas manufacturing plant at Plainfield, N. J., will not be dismantled. In fact it will be enlarged to the point of being able to furnish a supply of gas to the residents of North Plainfield, Dunellen, Bound Brook, Somerville and Metuchen.

THE Crawford Gas and Electric Company, of Galion, O., has been incorporated. Its capitalization is $150,000, and the Directors are: S. N. Blake, R. P. Jacks, R. O. Morgan, A. W. Lewis and B. W. Johnson.

MR. WILLIAM A. MEARES has been elected to the vacancy on the Board of Directors of the Georgetown (D. C.) Gas Light Company, occasioned by the death of Mr. John Marbury.

MESSRS. W. W. WARREN, Henry H. Sherwood and Willian R. Mc Caul are named as the incorporators of the Tomah (Wis.) Gas Company. The concern is capitalized in $40,000.

MR. W. R MCKEEN has been elected President of the Muncie (Ind.) Gas Light and Fuel Company, vice Mr. Charles A. Meeker. Mr. Robert Adams has been promoted to the Vice-Presidency.

MR. CHARLES A. MURPHY has been reappointed Superintendent of the Ottawa (Ills.) Gas Light and Coke Company, a position which he resigned in 1903 because of ill-health.

WE regret to have to chronicle the death of Mr. Francis Bredow, since 1883 Superintendent of the Davenport (Ia.) Gas and Electric Company, whose demise occurred at his home in Davenport the evening of the 15th inst. Deceased was in his 50th year, having been born in Holstein, Wis., July 20th 1855. He became a resident of Davenport in 1868, in which year his parents removed to the place named. He is survived by his widow and two daughters.

MR. WILLIAM T. WARD has been promoted to the dual position of Superintendent of Distribution and Office Manager of the Saginaw City (Mich.) Gas Company.

THE Calumet Lighting Company, which succeeded some time ago to properties of the Calumet Gas and Electric Company, has conveyed to the North Shore Electric Company all of the property (real personal and mixed) owned by it in Harvey and Chicago Heights, Ills.

WE understand that the Bristol and Plainville (Conn.) Tramway Company will construct a gas plant in East Bristol. Mr. E. A. Travis, of New Haven, it is said, will be prominent in the construction of the said plant.

A CORRESPONDENT in Harrisburg, Pa., writing under date of the 18th inst., says: "Judge Weiss gave an opinion yesterday that will have a far reaching effect in the merging of gas and electric light corporations in this State. He decided against S. L. Motter, the plaintiff, in an equity proceeding against the Kennett Township Electric Company, the Kennett Gas Light Company and the Kennett Gas, Fuel and Heat Company. The facts in the case are that a gas light company, a gas fuel and heating company and an electric company, chartered under the act of 1874 and its supplements, to furnish light, heat and power in Kennett Township, Chester County, sought to merge into one under the name of the Kennett Township Gas and Electric Company, with the right to exercise the privileges and power the three companies had under their separate existence. Mr. Motter, a stockholder of the electric company, filed a bill for an injunction in which he sought to restrain the people in charge of the proposed consolidation from filing the agreement of merger and consolidation, and gave as a reason that a gas company and an electric light company could not consolidate. The opinion holds that the new company could not compel the stockholder to take stock in the new corporation in payment of stock in the existing electric company, but Mr. Motter did not object to that feature. The decision indicates that a gas company has a right to merge and consolidate with an electric company exercising franchises in the same territory for the reason that both classes of companies are organized for the purpose of supplying heat or power to the public."

"L. G. T." sends the following from Los Angeles, Cal.: "The Los Angeles gas ordinance, over which there has been so much litigation, has been declared invalid by the United States Supreme Court in two test cases. The State Supreme Court was reversed in both instances. News of the action of the nation's highest tribunal was received by the Justices several days ago and the Clerk's office has since been officially notified. One case was a petition for a writ of habeas corpus and the other was a damage suit. The Los Angeles Board of Supervisors decided to keep a projected gas plant outside of certain limits and passed a general law to fit the case. A penalty clause was attached to the measure. Martin Daly, an employee of the gas company, violated a feature of the ordinance before witnesses and was arrested. Caroline W. Dobbins instituted a civil suit for damages to test the same provision and both cases were taken to the Supreme Court together. Daly was convicted of violating the measure in question and was fined $100. He appealed to the Superior Court, which upheld the action of the inferior tribunal. The State Supreme Court sustained the lower courts and an appeal was finally taken to the United States Supreme Court. Caroline Dobbins claimed that she had been damaged through the enforcement of the ordinance because it interfered with her constitutional rights. The Federal Supreme Court holds that the measure in aiming to prevent the construction of a gas works within certain limits is violative of the constitutional provisions, which guarantee rights in conducting legitimate business to all citizens. Daly is ordered released, Caroline Dobbins gets $144 damages and the gas works can be constructed as planned."

The Market for Gas Securities.

The legislative investigating committee has done something since its appointment. It has "bagged" a hall in which to conduct its hearings, and the sessions are accordingly to be held in the councilmanic chamber, which is not far from the rooms that shelter Mayor McClellan. The Committee has also secured "senior counsel" in the person of Mr. Charles E. Hughes, who is "senior member" of the firm of Messrs. Hughes, Rounds and Schurman. Up to last advices to-day (Friday) "junior" counsel had not been lassoed. The Committee does not seem to know how, where or when to begin its work, but it should begin soon if it is going to do anything that will justify its creation. Consolidated is dull and drowsy and lower, but our advice is to buy it at anything under 210 and to buy it now. The same remark applies to Brooklyn Union, and we would put 10 points on the buying price of the latter.

There is not much to chronicle in the outside market. Peoples, of Chicago, is steady at 111½ to 112; Baltimore consolidated is 86¾ bid, Laclede preferred is 100 bid, and Washington (D.C.) is 338¼ to 338½.

Gas Stocks.

Quotations by George W. Close, Broker and Dealer in Gas Stocks.

16 Wall Street, New York City.

March 27.

☞ All communications will receive particular attention.

☞ The following quotations are based on the par value of $100 per share.

N. Y. City Companies.	*Capital.*	*Par.*	*Bid.*	*Asked.*
Consolidated	$73,177,000	100	209½	206
Central Union, Bonds, 5's	3,000,000	1,000	108½	110
Equitable Bonds, 6's	1,000,000	1,000	105	..
" 1st Con. 5's	2,300,000	1,000	118	120
Mutual	3,500,000	100	300	320
Municipal Bonds	750,000	..	..	..
New Amsterdam Gas Co..				
Bonds, 5's	11,000,000	1,000	112	113¼
New York & Richmond Gas				
Co. (Staten Island)	1,500,000	100	35	.
1st Mtg. Gold Bds. 5 p. ct.	1,000,000	..	..	..
Northern Union, Bonds, 5's.	1,250,000	1,000	104	106
New York and East River..				
Bonds 1st 5's	3,500,000	1,000	112	114
" 1st Con. 5's	1,500,000	..	106½	108½
Standard	5,000,000	100	125	130
Preferred	5,000,000	100	145	155
Bonds, 1st Mortgage, 5's	1,500,000	1,000	116	117
Yonkers	299,650	500	130	..
Out-of-Town Companies.				
Brooklyn Union	15,000,000	100	205	215
" " Bonds (5's)	15 000,000	1,000	113	115
Bay State	50,000,000	50	¼	⅜
" ncome Bonds	2,000,000	1,000	..	75
Binghamton Gas Works	450,000	100	28	30
" 1st Mtg. 5's	500,000	1,000	93	96
Boston United Gas Co.—				
1st Series S. F. Trust	7,000,000	1,000	82	85
2d " " "	3,000,000	1,000	47½	50
Buffalo City Gas Co.	5,500,000	100	5	5¼
" " Bonds, 5's	5,250,000	1,000	66	68½
Capital, Sacramento	500,000	50	..	35
Bonds (6's)	150,000	1,000	..	..
Chicago Gas Co. Guaranteed Gold Bonds	7,650,000	1,000	104	104¼
Cincinnati Gas and Electric Co	29,500,000	100	108¾	109 x
Columbus (O.) Gas Co., 1st Mortgage Bonds	1,500,000	1,000	97½	99
Columbus (O.) Gas Lt. & Heating Co	1,682,750	100	88¼	89½
Preferred	3,026,500	100	107½	109
Consumers, Toronto	,000,000	50	200	204
Consolidated, Baltimore	11,000,000	100	..	87½
Mortgage, 6's	3,600,000	..	..	118
Chesapeake, 1st 6's	1,000,000	..	..	..
Equitable, 1st 6's	910,000	..	..	..
Consolidated, 1st 5's	1,490 000	..	..	112
Consolidated Gas Co. of N.J.	1,000,000	100	15	17
" Con. Mtg. 5's	880,000	1,000	89½	92
Bonds	75,000	..	..	100
Detroit City Gas Co	4,825,500	50	..	50
" Prior Lien 5's	5,603,000	1,000	99¼	100
Detroit Gas Co., 5's	351,000	1,000	75	75¼
" Inc. 5's	16,000	100	98¾	100
Equitable Gas & Fuel Co., Chicago, Bonds	2,000,000	1,000	..	101
Essex and Hudson Gas Co.	6,500,000	..	39	40
Fort Wayne	2,000,000	..	..	..
" Bonds	2,000,000	..	55	..
Grand Rapids Gas Lt. Co. 1st Mtg. 5's	1,225,000	1,000	104½	105
Hartford	750,000	25	190	200
Hudson County Gas Co., of New Jersey	10,500,000	..	104½	105½
" Bonds, 5's	10,500,000	..	107	108
Indianapolis	2,000,000	..	70	75
" Bonds, 6's	2,650,000	..	106½	108
Jackson Gas Co	250,000	50	82	..
" 1st Mtg. 5's	290,000	1,000	101	102½
Kansas City Gas Light Co., of Missouri	5,000,000	100	..	36
Bonds, 1st 5's	3,822,000	1,000	102	104
Laclede, St. Louis	10,000,000	100	..	..
Preferred	2,500,000	100	100	105
Bonds	10,000,000	1,000	108½	109
Lafayette Gas Co., Ind	1,000,000	100	..	60
Bonds	1,000,00(	1,000	60	65
Louisville	2,570,000	50	138	140
Madison Gas & Elec. Co.				
" 1st Mtg. 6's	350,000	1,000	107½	108¼
" 6 per cent. scrip, due 1910	100,000	25	85	87
Montreal, Canada	2,000,000	100	218	218¾
Nashville Gas Lt. Co.	1,000,000	100	110	..
Newark, N. J., Con. Gas Co.	6,000,000	..	56	58
Bonds, 6's	4,600,000	..	105	105¾
New Haven	2,000,000	25	200	..
Peoples G. L. & Coke Co., of Chicago	25,000,000	100	111½	111⅝
Peoples Gas Lt. & Coke Co., Chicago, 1st Mortgage	20,100,000	1,000	..	..
2d "	2,500,000	1,000	104	

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DIVIDEND NOTICE.

OFFICE OF THE UNITED GAS IMPROVEMENT CO.,
N. W. CORNER BROAD AND ARCH STS.,
PHILADELPHIA, PA., Mar. 8, 1905.

The Directors have this day declared a quarterly dividend of 2 per cent. (one dollar per share), payable April 15th, 1905, to stockholders of record at the close of business, Mar. 31, 1905. Checks will be mailed.

1553-5 LEWIS LILLIE, Treasurer

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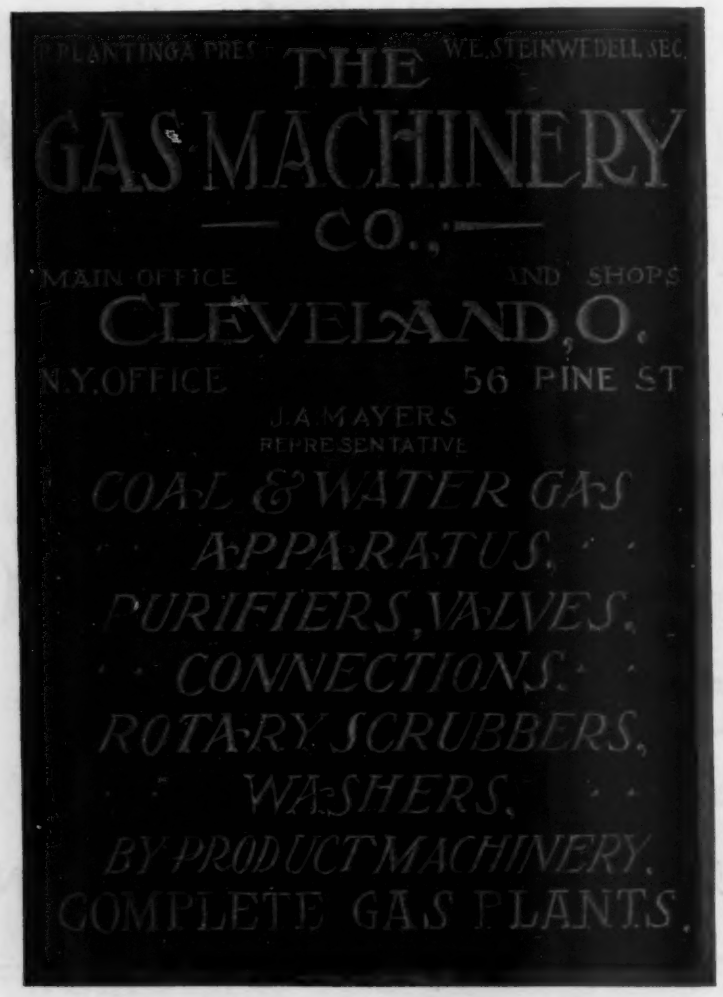

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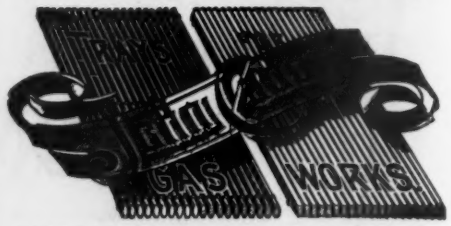

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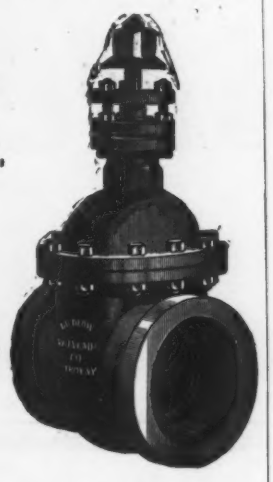

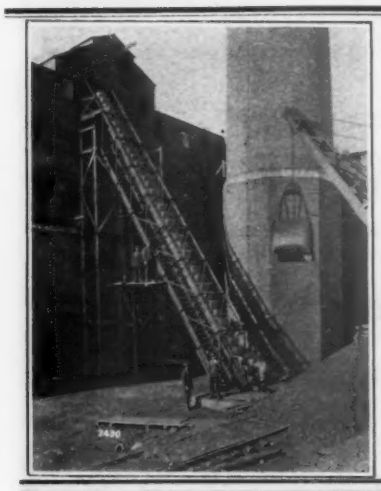

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Carried by wrought steel truss. Installed for the Boston Elevated Railway Co., Charlestown, Mass. Machinery receives from track hopper, to which coal is delivered by one-ton locomotive crane, and discharges to overhead distributing conveyor.

"Link-Belt" covers every step of this installation—not only the chain and conveyors, but the track hopper, the crane, the steel truss work—the entire design and construction of the machinery.

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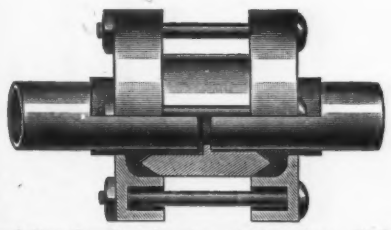
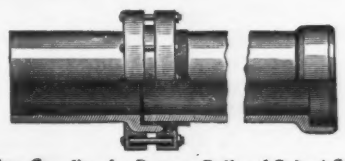
Patentee and Manufacturer of Specialties for Oil and Gas Lines.

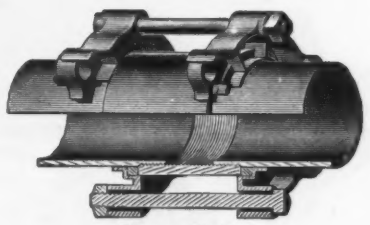


Insulating Coupling for Wrought Iron Pipe. Style 5.

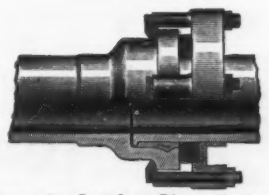


Insulating Coupling for Dresser Bell and Spigot Cast Iron Pipe. Style 6.

Regular Sleeve. Style 2.



Clamp. Style 4.



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Pipe Couplings, Sleeves, Clamps, Crosses, Tees and Ells.

My Insulating Coupling prevents the destruction of pipe by electrolytic action, in either water or gas lines.

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"OUR SPECIAL."

C—1008.

While a pressure tapping machine will also do dry tapping, it makes this work rather expensive.

The Mueller "Our Special" Tapping Machine is a substantially made dry tapper, costs about a third as much as a pressure machine and its use saves the latter for its more particular work. It does dry tapping at the lowest possible cost.

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Drilling and Tapping Pipe under Pressure

WITHOUT ANY ESCAPE OF GAS.

They are Strong and Compact.

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Machines Sent to any Gas Company for Thirty Days' Trial.

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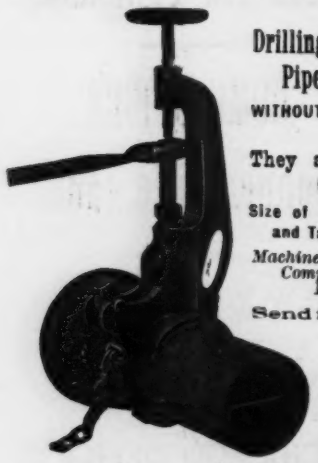

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Builders of UP-TO-DATE Machinery and Appliances for Coal and Water Gas Plants. :: :: :: :: ::

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Temporarily during alterations and repairs. : : : :

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Photometrical and Experimental Apparatus.

PUBLIC LIGHTING TABLE.

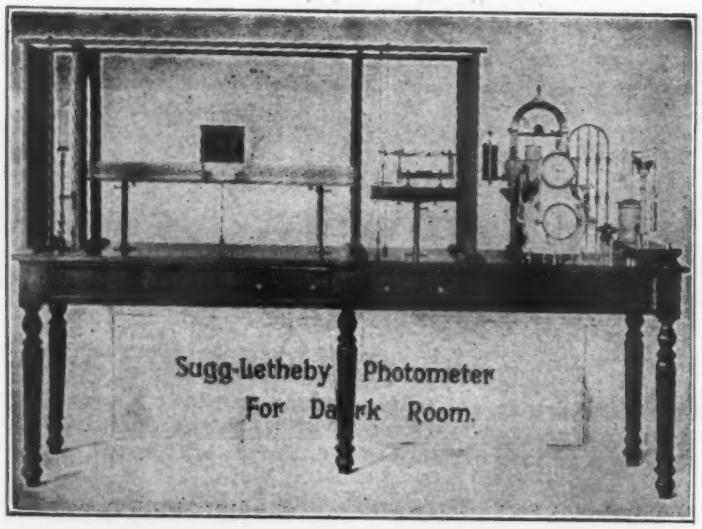
APRIL, 1905.

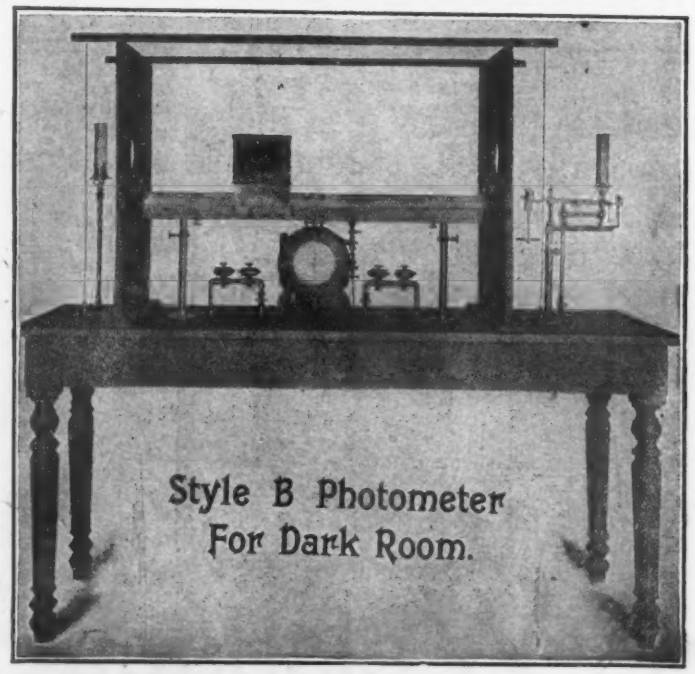
Day of Week.	Date.	Table No. 1. FOLLOWING THE MOON. Light.	Extinguish.
Sat.	1	6.50 PM	4.40 AM
Sun.	2	7.00	4.40
Mon.	3	7.00	4.40
Tue.	4	7.00 NM	4.40
Wed.	5	7.00	4.40
Thu.	6	7.00	4.40
Fri	7	7.00	4.40
Sat.	8	7.00	4.40
Sun	9	10.00	4.30
Mon.	10	10.50	4.30
Tue.	11	11.40	4.30
Wed.	12	12.30 AM FQ	4.30
Thu.	13	1.20	4.30
Fri.	14	2.00	4.30
Sat.	15	2.40	4.30
Sun.	16	3.20	4.20
Mon.	17	No L.	No L.
Tue.	18	No L. FM	No L.
Wed.	19	No L.	No L.
Thu.	20	7.10 PM	9.10 PM
Fri.	21	7.10	10.20
Sat.	22	7.10	11.30
Sun.	23	7.20	12.20 AM
Mon.	24	7.20	1.20
Tue.	25	7.20 LQ	2.00
Wed.	26	7.20	2.40
Thu.	27	7.20	3.20
Fri.	28	7.20	3.50
Sat.	29	7.20	4.00
Sun.	30	7.30	4.00

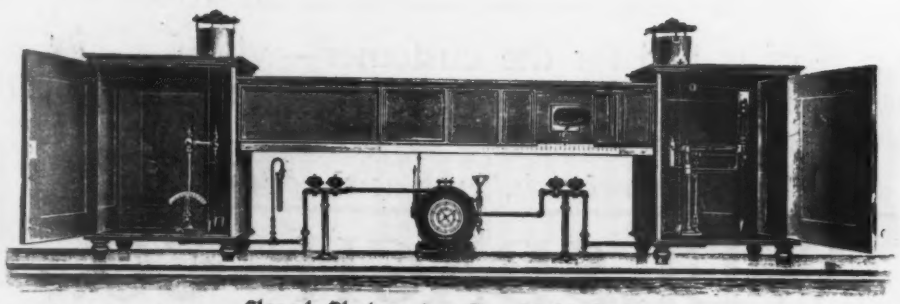
TOTAL HOURS DURING 1905.

By Table No. 1.

	Hrs.Min.
January	240.50
February	192.20
March	207.00
April	175.10
May	161.00
June	139.50
July	149.00
August	161.50
September	173.00
October	205.00
November	211.00
December	229.00
Total, yr.	2245.00







Closed Photometer For Light Room.

CIRCULARS SENT ON REQUEST.

PUBLIC LIGHTING TABLE.

APRIL, 1905.

Day of Week.	Date.	Table No. 2. NEW YORK CITY. ALL NIGHT LIGHTING. Light	Extinguish.
		P. M.	A.M.
Sat.	1	6.10	4.55
Sun.	2	6.15	4.40
Mon.	3	6.15	4.40
Tue.	4	6.15	4.40
Wed.	5	6.15	4.40
Thu.	6	6.15	4.40
Fri.	7	6.15	4.40
Sat.	8	6.15	4.40
Sun.	9	6.25	4.30
Mon.	10	6.25	4.30
Tue.	11	6.25	4.30
Wed.	12	6.25	4.30
Thu.	13	6.25	4.30
Fri.	14	6.25	4.30
Sat.	15	6.25	4.30
Sun.	16	6.30	4.20
Mon.	17	6.30	4.20
Tue.	18	6.30	4.20
Wed.	19	6.30	4.20
Thu.	20	6.30	4.20
Fri.	21	6.30	4.20
Sat.	22	6.30	4.20
Sun.	23	6.40	4.10
Mon.	24	6.40	4.10
Tue.	25	6.40	4.10
Wed.	26	6.40	4.10
Thu.	27	6.40	4.10
Fri.	28	6.40	4.10
Sat.	29	6.40	4.10
Sun.	30	6.45	4.00

TOTAL HOURS DURING 1905.

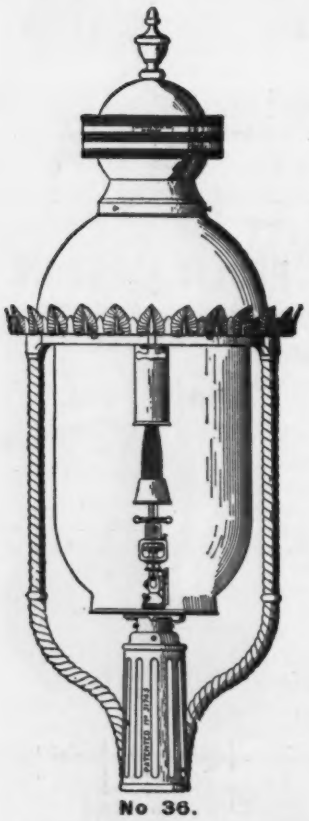
By Table No. 2.

	Hrs.Min.
January	423.20
February	355.25
March	355.35
April	298.50
May	264.50
June	234.25
July	243.45
August	280.25
September	321.15
October	374.30
November	401.40
December	433.45
Total, yr.	3987.45

NEW YORK, 9 Libert Street. BOSTON. 814 Beacon Building. PHILADELPHIA, Broad and Arch Streets. ST. LOUIS, 712 Roe Building. CHICAGO, Foot of Orleans Street. SAN FRANCISCO, 712 Polk Street.

WELSBACH STREET LIGHTING COMPANY

.... OF AMERICA ....



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Which includes its specially DESIGNED AND PATENTED BURNER for STREET and PARK LIGHTING exclusively.

Uniformly SUCCESSFUL in 150 Cities and Towns.

By means of the Welsbach System of street lighting the superiority of GAS over electricity for street lighting has been fully demonstrated.

POINTS OF MERIT:

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IT LIGHTS THE STREET.

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The formula is simple---

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Sell The Welsbach Brands.

The imitation stuff is bad for the customer---which is bad for you.

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Cincinnati, O. (2d contract).
Scranton, Pa. (3d contract).
New York City (14th contract).
New Haven, Conn. (2d contract).
Watertown, N. Y.
Tampa, Fla. (3d contract).
Westchester, N. Y. (3d contract).
Bridgeport, Conn. (2d contract.)
St. Paul, Minn. (2d contract).
Springfield, Mass. (2d contract).
Lynn, Mass. (5th contract).
Rochester, N. Y.
Battle Creek, Mich.
Mechanicsburg, Pa.
Excelsior Springs, Mo.
Bristol, Conn.
Jersey Shore, Pa.
Vicksburg, Miss.

TOTAL SETS, 1904, ... 45
TOTAL DAILY CAPACITY, 1904, ... 56,325,000 cubic feet.
TOTAL SETS TO DATE, ... 553
TOTAL DAILY CAPACITY, ... 419,180,000 cubic feet.

The United Gas Improvement Company,

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Established 1858. Incorporated 1890.
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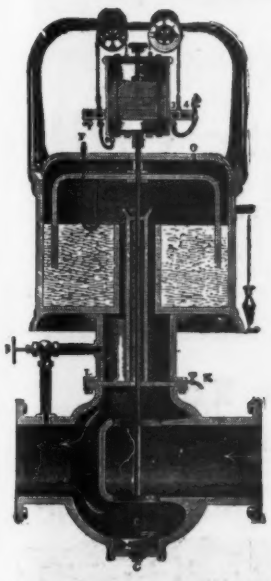

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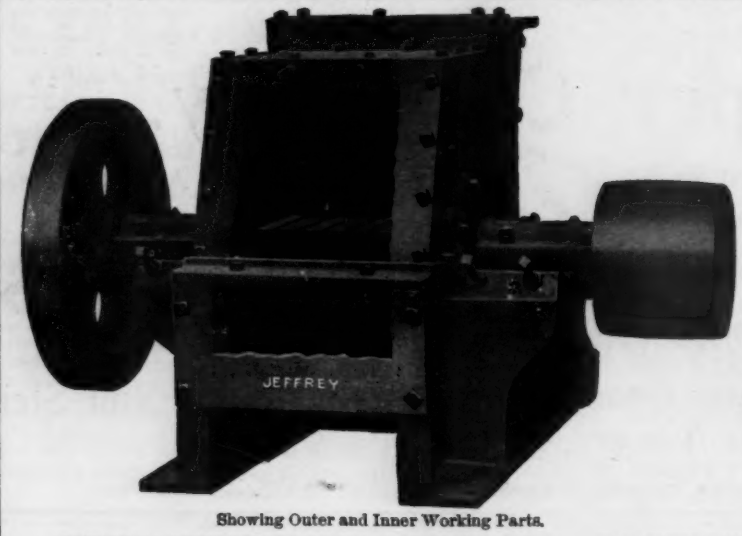

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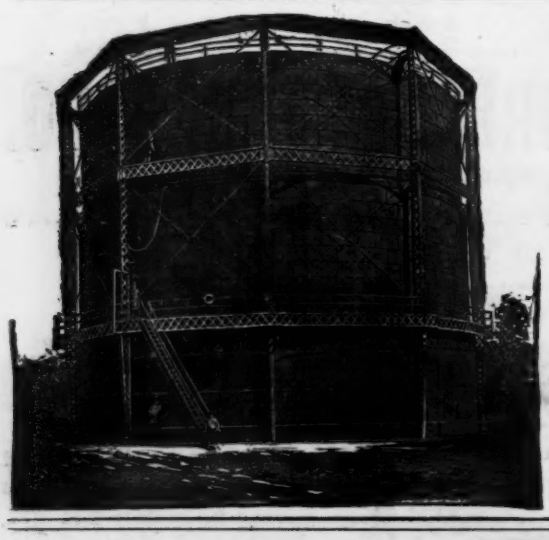

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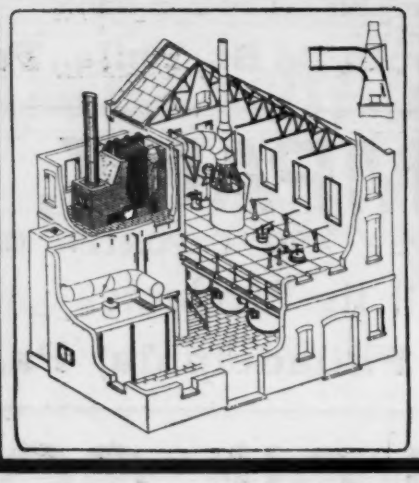

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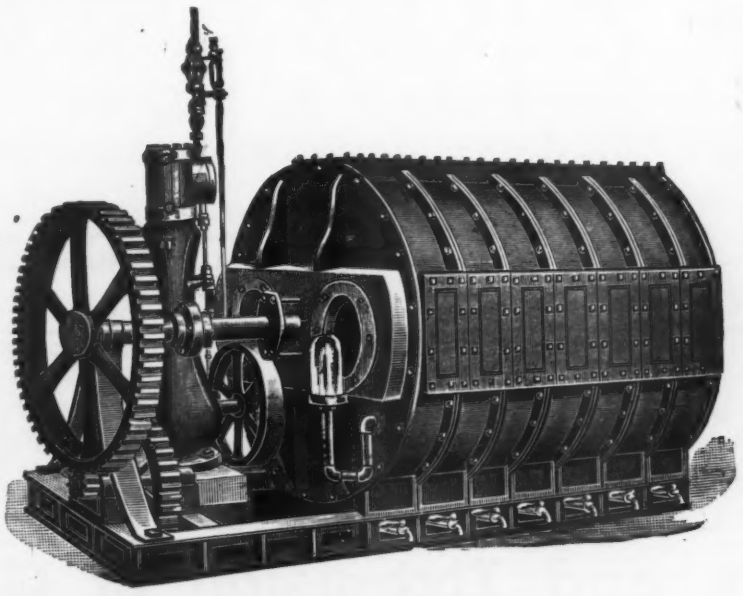

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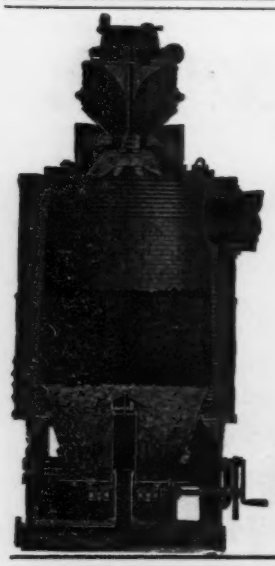

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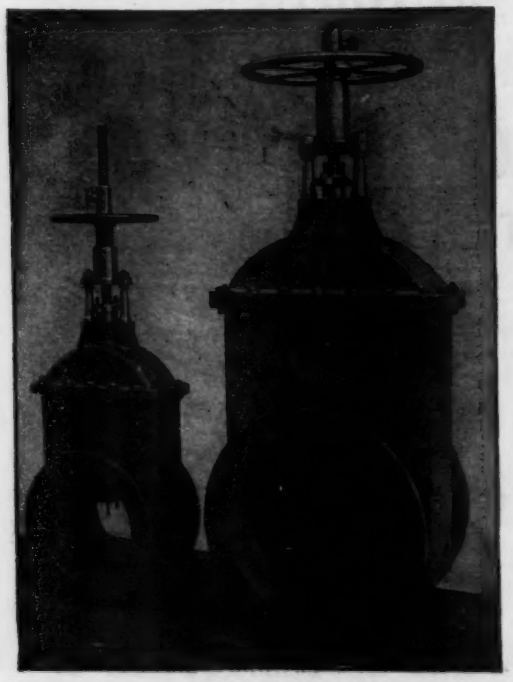

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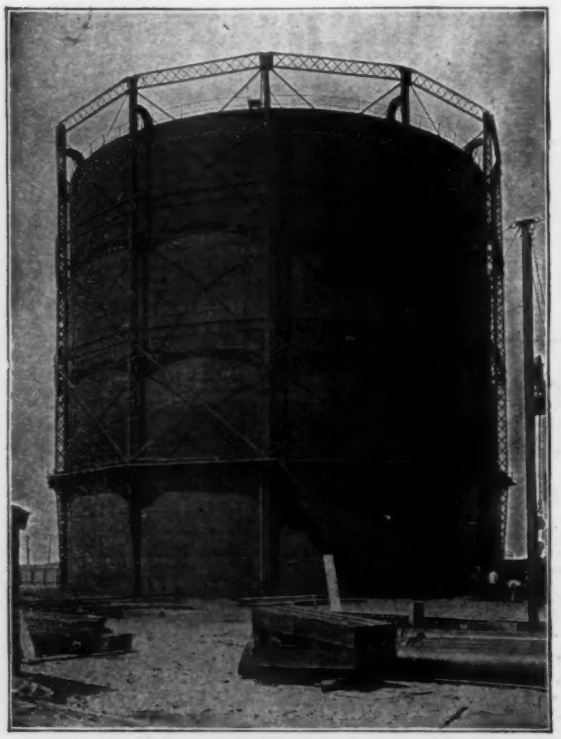

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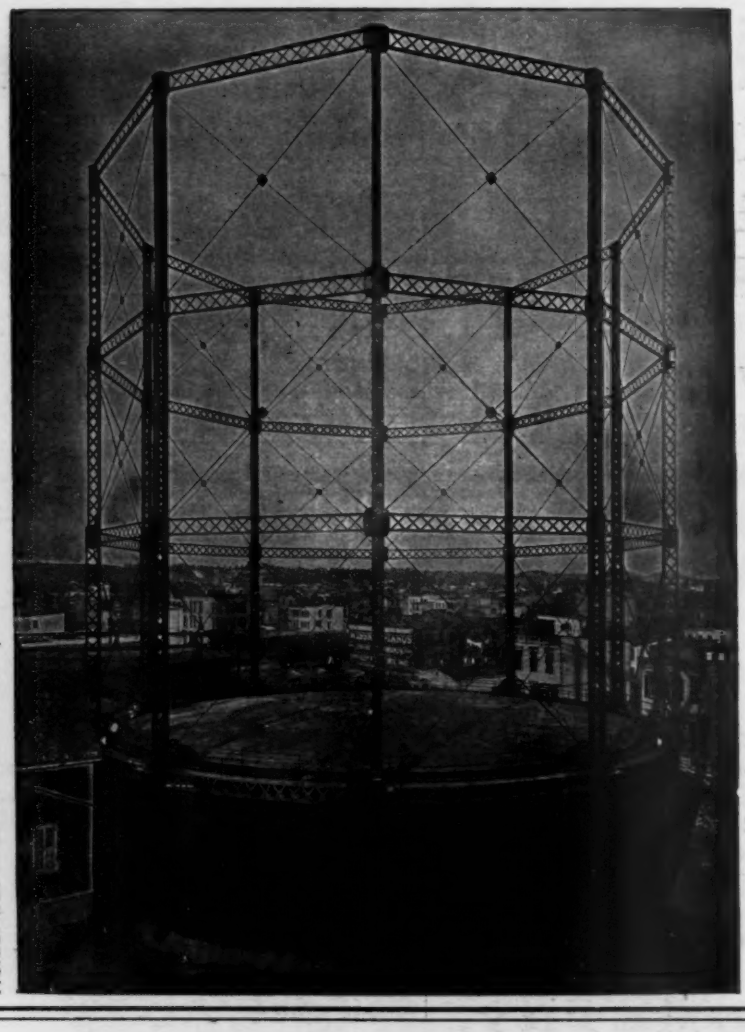

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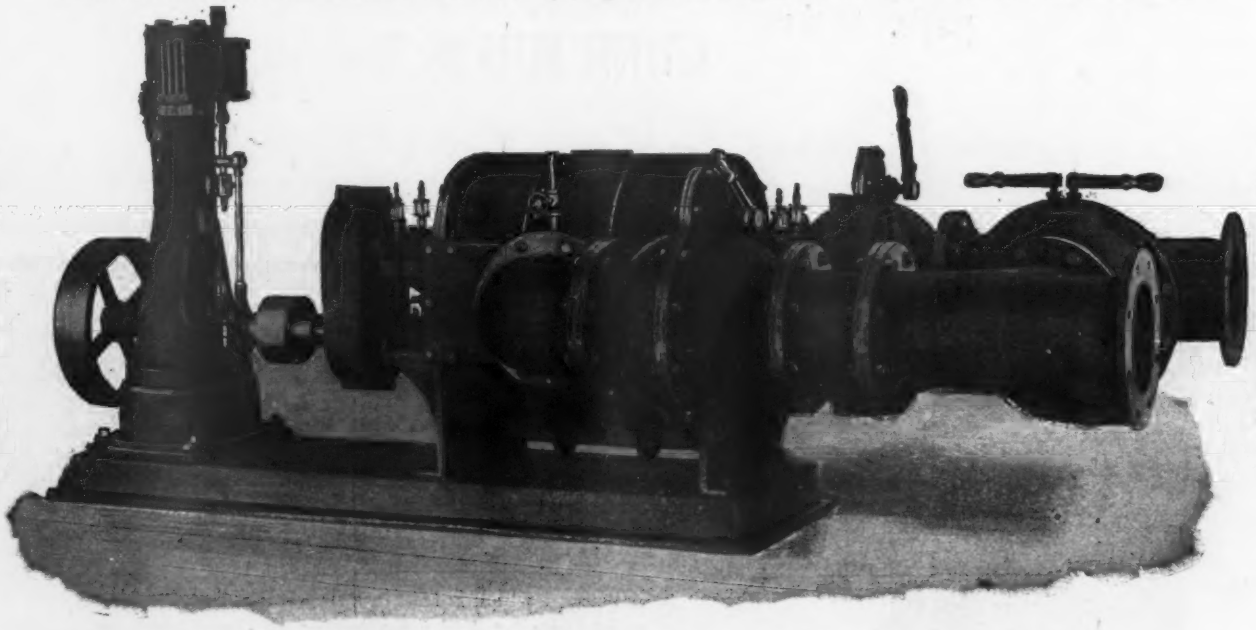

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